

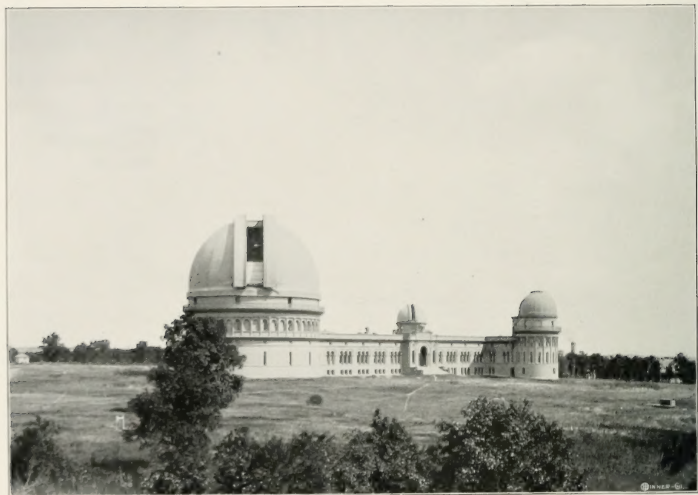
THE UNIVERSITY OF CHICAGO

PUBLICATIONS
OF THE
YERKES OBSERVATORY

VOL. I—1900.

Physical &
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THE YERKES OBSERVATORY OF THE UNIVERSITY OF CHICAGO

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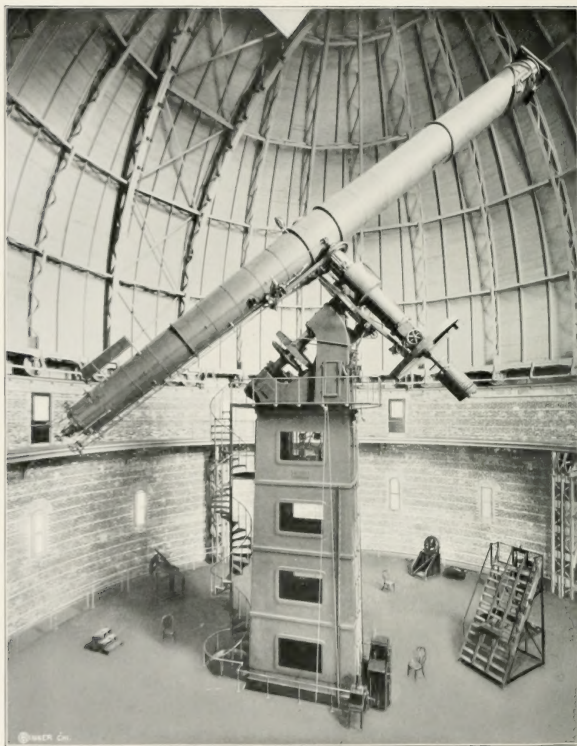
VOLUME I

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CHICAGO

THE UNIVERSITY OF CHICAGO PRESS

1900



THE 40-INCH CLARK TELESCOPE OF THE YERKES OBSERVATORY
MOUNTED BY WARNER & SWASEY

A GENERAL CATALOGUE

cc1

1290 DOUBLE STARS

DISCOVERED FROM 1871 TO 1899 BY S. W. BURNHAM. ARRANGED IN
ORDER OF RIGHT ASCENSION WITH ALL THE MICROMETRICAL
MEASURES OF EACH PAIR

BY

S. W. BURNHAM

CHICAGO
THE UNIVERSITY OF CHICAGO PRESS

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TO THE MEMORY OF

BARON DEMBOWSKI

THE DISTINGUISHED DOUBLE STAR OBSERVER, THE FIRST TO UNDERTAKE
THE SYSTEMATIC MEASUREMENT OF THESE STARS, AND
WHOSE KINDLY CRITICISM AND GENIAL ENTHUSIASM
WERE TO THE WRITER ALWAYS AN
INSPIRATION

THIS VOLUME

IS GRATEFULLY INSCRIBED

INTRODUCTION

A general catalogue of all the double stars discovered by me from time to time during the past twenty-five years has long been needed by those interested in this field of astronomical research, and, by reason of the special interest attached to many of these remote sidereal systems, it has become more and more important to bring the scattered material together in order to intelligently pursue the investigations which promise to so much increase our knowledge of the great universe beyond the solar system. These discoveries are scattered through nineteen different catalogues, published at various times and places, commencing with 1873; and the observation of these stars by a great number of astronomers in this country and in Europe can only be made use of by consulting hundreds of volumes of observatory and society publications, astronomical periodicals, etc. It is difficult, if not practically impossible, for the general observer or investigator to make a really complete collection of all the measures of a large number of these stars. Many of the observations are in obscure and unusual places, and in works not always readily accessible.

This general catalogue was arranged and prepared for publication in the latter part of my connection with the Lick Observatory, 1888-1892, and most of my work with the great 36-inch refractor of Mt. Hamilton during those four years was devoted to the careful remeasurement of the stars contained in the catalogues published prior to that time, and to the discovery and observation of another and more difficult class of doubles for which that splendid instrument is so well adapted. A new field was opened which was beyond the reach of most of the telescopes of the world. The pages of this catalogue will bear witness to the importance of the additions in the way of new measures and new systems made at the Lick Observatory during this time. For various reasons this catalogue was not published at that time. Since then it has been kept up to date by the addition of all the more recent measures, and the places recomputed by using later star catalogues, particularly those of the *Astronomischen Gesellschaft*, so far as published, the Cordoba catalogues of southern stars, and the other recent publications, in lieu of the places originally taken from Lalande, Argelander's *Durchmusterung*, Weisse, etc. In this way some minor errors have been eliminated in the places, and in the identity of some of the stars. No attempt has been made to make this work a substitute for original star catalogues with respect to the absolute places of these stars in the heavens. As these positions have no other use than for finding the objects with the telescope, it was not considered worth while to reduce them to any later epoch than that used in the several original double star catalogues, that epoch being uniformly 1880. In the star catalogue references, preference has been given, where the stars are below the naked-eye limit, to the old standard catalogues, although the places have been derived from more modern observations.

THE FIRST OBSERVATIONS

It may not be out of place here to give a brief history of the beginning of this astronomical work. When in London, about 1861, I purchased one of the cheap astronomical telescopes introduced about that time. It had a nominal aperture of three inches, but was without a finder, and had only the simple alt-azimuth mounting, with a common table tripod. It was supplied with a terrestrial, as well as astronomical, eyepiece and while it was a good instrument for landscape use, it was of little value for astronomical purposes. Some years later I obtained a $3\frac{3}{4}$ -inch telescope, with an English object-glass, mounted equatorially by Fitz on a portable stand. This was just good enough to be of some use, and poor enough, so far as its optical power was concerned, to make something better more desirable than ever. In 1869 I accidentally met Mr. Alvan G. Clark in Chicago, on his return from Iowa, where he had been to observe the total eclipse of that year, and made some

inquiries of him about a small equatorial. This interview resulted in my ordering from the celebrated firm of Alvan Clark & Sons an equatorial of six inches aperture. I told them what I wanted, and what I wanted it for. Every detail was left entirely to their judgment, stipulating only that its definition should be as perfect as they could make it, and that it should do on double stars all that it was possible for any instrument of that aperture to do. In due course of time this instrument was delivered, and was set up in an observatory prepared for it in the meantime. My attention for some reason or other, which I am unable to explain, had been almost exclusively directed to double stars previous to this while using the smaller telescope referred to. This preference was not in any sense a matter of judgment as to the most desirable or profitable department of astronomical work, or the result of any special deliberation upon the subject. It came about naturally, without any effort or direction upon my part.

At the beginning of the use of the 6-inch telescope my library, so far as the subject of double stars was concerned, was principally confined to the first edition of Webb's *Celestial Objects for Common Telescopes*, and I wish here to record my great indebtedness to this most admirable and really indispensable book. It was of great assistance to me at that time, and it has never ceased to be a valuable and convenient work for frequent reference. It contains about all that the beginner is likely to want in connection with any use of a small telescope. It has passed through several editions since that time, the last one containing many of these stars. The time came finally when other double-star catalogues were necessary. Double stars were frequently found which were not in Webb, and then it was necessary to ascertain what they were. The books at the Dearborn Observatory, then in charge of Professor T. H. Safford, were always accessible to me. This library had some of the principal star catalogues, but very little relating to double stars except Struve's *Mensuræ Micrometricæ*. The result was that from time to time I made manuscript copies at the Naval Observatory, the Dartmouth College Observatory, and other places, and from books borrowed from these institutions and various astronomers, of the essential results of most of the leading catalogues and observations relating to this subject. These copies included Struve's *Mensuræ Micrometricæ*, *Positiones Medie*, and *Catalogus Novus*; the seven catalogues of Sir John Herschel; the catalogues of South, and Herschel and South, in the *Philosophical Transactions*; the *Poulkova Catalogue* of O. Struve; the measures of Madler in the *Dorpat Observations*; material given in the *Memoirs* and *Monthly Notices of the Royal Astronomical Society*, *Astronomische Nachrichten*, and publications of like character; and many minor contributions, including nearly all the discoveries made after the Struves. While the labor involved in doing this work was very great, there was perhaps a corresponding advantage gained in acquiring a more thorough familiarity with the literature of this subject. Since that time these and many other works of like character have been obtained, and my library is practically complete, so far as double-star material is concerned.

The want of a single catalogue of all the double stars visible in the northern hemisphere was very manifest soon after the commencement of the observations with the 6-inch refractor. Many pairs were picked up on every good night which it was desirable to identify with as little loss of time as possible. If wanting in Struve, Herschel, and other of the old catalogues, they might still be known pairs, and it was unsafe to assume that they had not been before observed, without a careful examination of many minor lists, catalogues and observations of various kinds, scattered throughout a large number of volumes issued by observatories and societies, periodicals, handbooks and monographs printed in the last hundred years. I was therefore compelled in the interest of my own work to bring this material together and arrange all the pairs in order of Right Ascension in a general catalogue. In this way I made a manuscript catalogue of every known double star within 121° of the north pole, giving the details of measures, magnitudes, star catalogue references, etc. With this at hand, it was but a moment's work at the telescope to identify any known object, and to decide at

once whether or not an object thus found was really a new pair. This catalogue subsequently passed into a second manuscript edition, more complete and perfect in respect to some details. All the star places were reduced to a common epoch, and every measure of each pair was either given or cited. This served the purpose for a good many years, but the time came when the manuscript became too crowded by the interlineation of stars discovered by myself, and by other observers, and by the addition of a great number of references to measures and observations, and then I undertook the preparation of a third manuscript edition, which was arranged in the proper form for printing, with ample space for new stars and new observations, and giving a brief statement or discussion of the character of each pair of any general interest. This catalogue, substantially bound in twelve volumes, has all the time been kept posted to date by the addition of all new material as soon as printed, and many unpublished discoveries and observations. This general catalogue in its various forms has been of the greatest value and assistance to me from the beginning in all this work. In fact, it rendered possible all that has been accomplished in this field. Very few will fully appreciate the enormous amount of hard work which has been necessarily expended in the preparation of such a work. Whether it will ever assume other than the present manuscript form remains to be seen. It should be remarked in this connection that, with the exception of the four years, 1888-1892, all of this astronomical work, with the telescope and otherwise, has been done when eight or more hours of at least six days in the week were more or less occupied with other and very different affairs of life.

THE ORIGINAL LISTS OF NEW DOUBLE STARS

My discoveries of double stars may be said to have commenced in 1872, although the 6-inch Clark refractor had been in my possession for a year or two previously. A complete list of the nineteen catalogues, which are included in this work is as follows:

- FIRST CATALOGUE (β 110 to 841). *Monthly Notices of the Royal Astronomical Society*, XXXIII, 355 (March 1873). Discovered with the 6-inch refractor.
- SECOND CATALOGUE (β 82 to 1400). *Monthly Notices of the Royal Astronomical Society*, XXXIII, 437 (March 1873). Discovered with the 6-inch refractor.
- THIRD CATALOGUE (β 107 to 182). *Monthly Notices of the Royal Astronomical Society*, XXXIV, 59 (December 1873). Discovered with the 6-inch refractor.
- FOURTH CATALOGUE (β 183 to 229). *Monthly Notices of the Royal Astronomical Society*, XXXV, 382 (June 1874). Discovered with the 6-inch refractor.
- FIFTH CATALOGUE (β 230 to 300). *Monthly Notices of the Royal Astronomical Society*, XXXV, 31 (November 1874). Nos. 230 to 252 were discovered with the 6-inch refractor; Nos. 253 to 281 with the 9.4-inch refractor of the Observatory of Dartmouth College, and Nos. 286 to 300 with the 26-inch refractor of the Naval Observatory at Washington.
- SIXTH CATALOGUE (β 301 to 399). *Astronomische Nachrichten*, No. 2062. Discovered with the 6-inch refractor.
- SEVENTH CATALOGUE (β 301 to 439). *Astronomische Nachrichten*, No. 2113. Also reported in the *American Journal of Science*, September 1876. Discovered with the 6-inch refractor.
- EIGHTH CATALOGUE (β 437 to 452). *American Journal of Science* (July 1877). Discovered with the 18½-inch refractor of the Dearborn Observatory.
- NINTH CATALOGUE (β 453 to 482). *Monthly Notices of the Royal Astronomical Society*, XXXVIII, 78 (December 1877). Discovered with the 6-inch refractor.
- TENTH CATALOGUE (β 483 to 733). *Memoirs of the Royal Astronomical Society*, Vol. XLIV. Discovered with the 18½-inch refractor of the Dearborn Observatory. (This volume contains also measures of 500 other double stars with the same instrument.)

General Catalogue of Double Stars

- TENTH CATALOGUE** (β 751 to 800). *Report of the Trustees of the James Lick Trust of Observations made on Mt. Hamilton with reference to the Location of the Lick Observatory, 1880.* Observations with the 6-inch refractor on Mt. Hamilton in 1879. There are measures of a few of the old pairs with the same instrument. (This report is reprinted in *Publications of the Lick Observatory*, Vol. I.)
- TWELFTH CATALOGUE** (β 776 to 863). *Publications of the Washburn Observatory*, Vol. I. Observations with the 15½-inch equatorial of the Washburn Observatory, Madison, Wis., in 1881. (This volume contains also several hundred measures of other double stars.)
- THIRTEENTH CATALOGUE** (β 864 to 1025). *Memoirs of the Royal Astronomical Society*, Vol. XLVII. Nos. 864 to 997 discovered with the 18½-inch refractor of the Dearborn Observatory; Nos. 998 to 1013 with the 12-inch of the Lick Observatory in October 1881; and Nos. 1014 to 1025 with the 18½-inch at Chicago. (This volume contains a large number of measures of Struve and other pairs.)
- FOURTEENTH CATALOGUE** (β 1026 to 1038). *Astronomische Nachrichten*, No. 2875. Observation with the 12 and 36-inch refractors of the Lick Observatory. The numbers were inadvertently omitted, but are given in the introduction to Catalogue XV. (*Astronomische Nachrichten* 2875 also contains measures of other stars.)
- FIFTEENTH CATALOGUE** (β 1039 to 1092). *Astronomische Nachrichten*, Nos. 2920, 2930. Observations with the 36-inch refractor. (Also measures of other double stars.)
- SIXTEENTH CATALOGUE** (β 1093 to 1154). *Astronomische Nachrichten*, Nos. 2956, 2957. Observations with the 36-inch refractor. (Also measures of other double stars.)
- SEVENTEENTH CATALOGUE** (β 1155 to 1224). *Astronomische Nachrichten*, Nos. 3047, 3048. Observations with the 36-inch refractor, and measures of other stars.
- EIGHTEENTH CATALOGUE** (β 1225 to 1266). *Astronomische Nachrichten*, Nos. 3113, 3114. Observations with the 36-inch refractor, and measures of other stars.
- NINETEENTH CATALOGUE** (β 1267 to 1274). *Astronomische Nachrichten*, Nos. 3141, 3142. Observations with the 36-inch refractor. (Catalogues XIV to XIX are given in *Publications of the Lick Observatory*, Vol. II.)
- (β 1275 to 1290). Published for the first time in this volume.

THE TELESCOPES USED

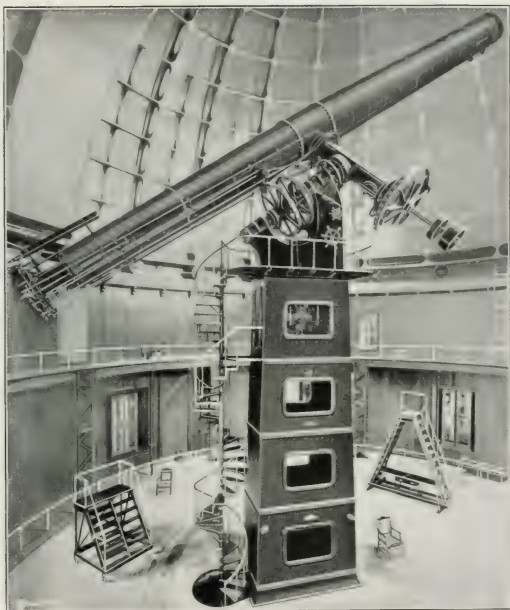
It is worthy of note in this connection that all of these new stars, without exception, were discovered with telescopes made by Alvan Clark & Sons. In one sense the success of this work is due to these eminent opticians, for nothing is more certain than that these discoveries could not have been made with any other class of telescopes. These instruments in order of aperture are as follows:

The 6-inch refractor. It is hardly necessary to say, in view of the discoveries made with it and given in this catalogue, that its performance on the most difficult objects was simply perfect. Many of the stars discovered with it are by no means easy to measure with the largest telescopes now in use. Some of the most rapid and interesting binaries in this catalogue were discovered with this instrument. It now belongs to the Washburn Observatory of the University of Wisconsin.

The 9.4 inch refractor of the Dartmouth College Observatory. During the summer of 1874 I spent a vacation within a few miles of this place. Before leaving for China on the Transit of Venus expedition, Professor Young very kindly placed his telescope at my disposal, and I spent some ten nights at that Observatory, with the results given in the *Fifth Catalogue*.

The 12 inch refractor of the Lick Observatory. The discoveries made with this telescope when I was on Mt. Hamilton for the second time, in 1881, are found in the *Thirteenth Catalogue*. The observations from 1888 to 1892 are contained in the Mt. Hamilton catalogues. Some of the most difficult pairs were discovered with this instrument. It is now in the hands of Professor G. A. Johnson at Austin, Texas.

The 15.5-inch refractor of the Washburn Observatory at Madison, Wisconsin. The results of some four or five months' work with that telescope in 1881 will be found in the *Twelfth Catalogue* (*Publications of the Washburn Observatory*, Vol. I.) This is an excellent instrument, and very convenient to use in all its appointments.



THE 36-INCH CLARK TELESCOPE OF THE LICK OBSERVATORY
MOUNTED BY GRANT & GRANT

The 16-inch refractor of the Warner Observatory at Rochester, N. Y. I had the pleasure of spending an evening with Dr. Lewis Swift, and picked up two or three new pairs which are given in my later catalogues. This fine instrument is now at the Lowe Observatory, in southern California.

The 18.5-inch refractor of the Dearborn Observatory at Chicago. This, at the time it was made, was the largest refractor in the world; and, although one of the early works of Clark & Sons, the definition of the object-glass is as perfect as any of their later productions. This is established by the discoveries and measures in my *Tenth* and *Thirteenth Catalogues*. The Dearborn Observatory, at that time, was attached to the old University of Chicago, and was located about three and a half miles from the business center of the city.

The 26-inch refractor of the Naval Observatory at Washington. I had the privilege of using this instrument one night in 1874, and found the new stars given in my *Fifth Catalogue*.

The 36-inch refractor of the Lick Observatory. With reference to the superb definition and light-power of the great telescope, it is sufficient to refer to the discoveries, and the measures of difficult objects contained in my last five catalogues. These will demonstrate the immense superiority of this instrument over all others elsewhere. There is probably no place in the world, where an observatory has been established, which can compare favorably with Mt. Hamilton.

The 40-inch refractor of the Yerkes Observatory. In the last two years I have given the time spent at the Yerkes Observatory to the re-measurement of these stars, where recent measures were wanting, and where change was shown by the prior observations. Much of the time the most difficult of these pairs could not be observed under the conditions present. All the measures given in the following pages, as made by me in 1897, 1898, and 1899, were made with this instrument. Altogether I have made about 950 measures of these pairs. Of course the number of measures which can be made in a given time with so large an instrument is much less than it would be with the other equatorials used in this work. More time is necessarily used in setting on stars in different parts of the sky than would be required with a moderately large aperture. When the 40-inch refractor is moved by hand, as it must be in getting every object into the field, it is necessary to move about twenty tons.

In the course of these observations, sixteen new pairs, Nos. 1275 to 1290, have been added to this catalogue, eight of which were noted with the large refractor. The others were stars discovered many years ago, some at Mt. Hamilton, and others at the old Dearborn Observatory, but were forgotten to be included in the catalogues of that time. In looking over my old observing books, I have made a note of some of these omissions, and as far as possible recovered and measured them for this work.

DISTRIBUTION OF DISCOVERIES

An examination of this catalogue to ascertain the distribution of the discoveries among the several telescopes used in this work shows the following:

6-inch—Private Observatory	451
18½-inch—Dearborn Observatory	413
36-inch—Lick Observatory	198
15½-inch—Washburn Observatory	87
12-inch—Lick Observatory	50
9.4-inch—Darmouth College Observatory	24
26-inch—Naval Observatory	14
40-inch—Yerkes Observatory	8
16-inch—Warner Observatory	2

MICROMETRICAL MEASURES

The first measures of these stars were made by the late Baron Dembowski. I was fortunate in being placed in communication with this eminent astronomer soon after the commencement of my work with the 6-inch refractor, and from that time on until his death, in 1881, I was in constant correspondence with him, and all of my discoveries were transmitted to him in advance of their

These stars were measured by him in the most painstaking and thorough manner, and his observations give the fundamental data for comparison with subsequent measures of very many of the most important of these new systems. As an observer with the micrometer he had no superior, and few, if any, equals. His work is of the highest degree of accuracy. He made no mistakes, and wasted no time in idle speculations. He has left a record of honest, thorough and consistent work which will be an honor to his memory for all time. Baron Dembowski was to me an example so inspiring, a critic so genial and frank, a friend so warm-hearted and disinterested that simple justice as well as friendship impels me to inscribe this volume to his memory. The Royal Astronomical Society recognized the value of his services by the award of its gold medal in 1878. The results of his life-work have been published in two large volumes prepared and issued after his death under the direction of the two distinguished astronomers, Otto Struve and Schiaparelli. These observations are indispensable to every observer engaged in this department of work.

My own work with the micrometer commenced with the use of the 18½-inch equatorial of the Dearborn Observatory, situated then in the city of Chicago. It was continued for a few months at the Washburn Observatory, at Madison, Wis., in 1881, and was then suspended until the commencement of my duties at the Lick Observatory in the latter part of 1888. During the four years spent at that place my time was almost exclusively given to the measurement and discovery of double stars. If the discovery of new pairs, regardless of their micrometrical measurement, had been the paramount object, this general catalogue would have been increased by the addition of at least many hundred new pairs; but I deemed it of the first importance to accompany each discovery with a careful set of measures. This seemed the more necessary because most of the pairs found with the large refractor were too difficult for ordinary instruments; and therefore it was very desirable that good positions should be obtained with which future observations, whenever made, could be compared. A considerable portion of the time was given to the re-measurement of the stars previously discovered, and new pairs added no faster than they could be thoroughly observed with the micrometer.

Below is given a list of the principal observers whose measures of these stars are given in this work.

AITKEN, R. G.	ENGELMANN, R.	SCHIAPARELLI, G. V.
BARNARD, E. E.	GLASENAPP, S.	SCOTT, J. L.
BOOTHROYD, S. L.	HALL, ASAPH	SEE, T. J. J.
BOWYER, W.	HOUGH, G. W.	SELLORS, R. P.
BROWN, S. J.	HOWE, H. A.	STONE, ORMOND
CHAMBERS, W. A.	HUSSEY, W. J.	STRUVE, H.
COGSWELL, W. A.	LAMB, ALICE	STRUVE, O.
COLLINS, W. H.	LEAVENWORTH, F. P.	FARRANT, K. J.
COMSTOCK, G. C.	LEWIS, THOMAS	WILSON, H. C.
DEERCE, J. H.	MAW, W. H.	UPDEGRAFF, MILTON
DOOLITTLE, E.	MILLER, LEASE	UPTON, WINSLOW
DYSON, F. W.	POLLOCK, J. A.	
EGBERT, H. V.	PRITCHETT, H. S.	

LIST OF DOUBLE STARS

In giving the number of nights included in the mean result given in the catalogue, I have stated it as the number of complete measures; that is, when distance and position-angle are both measured. In many instances the angle has been measured on a greater number of nights than that given here.



THE 18 1/2-INCH CLARK TELESCOPE OF THE OLD UNIVERSITY OF CHICAGO (DEARBORN OBSERVATORY)

The total number of double stars now known has been greatly overstated by some writers. It has been said that the number is ten thousand and upwards. This is correct if the number is to be arrived at by adding all the stars contained in the various early double star catalogues; but it must be remembered that these lists, and particularly those of the Herschels, include a large proportion of very faint and very wide stars which cannot be called double in the proper sense of the word. The distance between them is much too great to make it in the least probable that the stars have any physical connection. With such a standard the number of pairs could be increased to hundreds of thousands by sweeping with a very moderate aperture. The number recorded in a single night would be limited only by the time occupied in reading the circles, and fixing the star places. The great majority of binary stars are moderately close pairs, where the mean distance does not exceed $2''$; and all the short period binaries are very much closer. In the appendix to my *Thirteenth Catalogue* I gave a tabular statement showing the whole number of double stars of Class I (distance $0''$ to $1''$) and Class II (distance $1''$ to $2''$) in all the original double star catalogues published at that time. This statement, with my later results added in 1891, is as follows:

	Class I	Class II	Total	Ratio
BURNHAM. Catalogue of 1260 stars	385	305	690	550 : 1000
O. STRUVE. Catalogue of 547 stars	154	63	217	400 : 1000
STRUVE. Catalogue of 2640 stars	91	314	405	150 : 1000
HERSCHEL I. Catalogue of 812 stars	12	24	36	4 : 1000
HERSCHEL II. Catalogue of 3429 stars	2	20	22	7 : 1000

It will be seen from this exhibit that prior to 1870 all the leading double star catalogues combined, including altogether not less than 7400 so-called double stars, contained less than 700 pairs with distances not exceeding $2''$. It will be noticed also that 60 per cent. of all known pairs with distances of $1''$ and less had been discovered in the preceding twenty years.

It is apparent from this investigation that upon a very liberal estimate there were not more than 4000 or 5000 stars within 120° of the north pole which could be properly called double; and that many of this number were of little interest as physical systems, or likely to become so hereafter. In some instances the recording and measuring of a distinct companion has been of value in determining the proper motion of the primary; and in other instances it has been shown that the proper motion is common to both stars, and that therefore they have some connection with each other.

In recent years many new double stars have been discovered by a number of American observers. Of these special mention should be made of the several catalogues of new pairs recorded by Hough with the $18\frac{1}{2}$ -inch of the Dearborn Observatory, which is now connected with the Northwestern University at Evanston, Ill., and of the discoveries by See at the Lowell Observatory. These catalogues contain many close and interesting objects.

THE FIELD FOR DISCOVERY

For many years prior to 1870 it seems to have been practically accepted that the field for the discovery of new pairs had been substantially worked out by the Herschels and the Struves, and that so little had been overlooked by these eminent pioneers in this work that there was little chance for later observers to make many important additions. The great work of the first Struve, *Mensuræ Micrometricæ*, published in 1827, contained all known double stars within 105° of the north pole. The stars discovered by Herschel I, and other early observers, which were within the wide limits of distance adopted by Struve, are embraced in his great catalogue. His examination of the heavens

of new pairs was as complete and thorough as could have been expected under the conditions existing at that time. This was supplemented by the labors of his equally distinguished son, Otto Struve, who continued the work with the more powerful telescope at Poulkova, and added some four hundred new pairs, published in 1850 as the *Poulkova Catalogue*. For many years after this there was very little done in this field of astronomy, aside from the measurement of the pairs previously discovered; and that seems to have been taken by observers generally as about the only thing remaining to be done.

In 1837 Professor O. M. Mitchel visited Europe for the purpose of inspecting foreign observatories, and purchasing a telescope for the proposed Cincinnati Observatory. In the interest of this object he visited most of the leading European astronomers, and, among others, Sir James South. This was during, or about, the time of a long litigation which grew out of a contract between this astronomer and a firm of instrument makers who undertook to mount equatorially a large object glass belonging to South. Mitchel, in describing his interview, says:

One apartment was examined after another, until finally we reached a large room surmounted by a dome of great size and of an expensive construction, while fragments of the framework for mounting a great equatorial were scattered around.

"Here, sir," exclaimed Sir James, "you behold the wreck of all my hopes. Here I have expended thousands, and flattered myself that I was soon to possess the finest instrument in Europe; but it is all over, and there's an end."

I remarked that the object-glass was still in his possession, and might yet be mounted so as to realize his hopes and expectations.

"No," said Sir James, "Struve has reaped the golden harvest among the double stars, and there is little now for me to hope or expect."

It would be difficult to appreciate the feelings which at that moment were sweeping through the mind of the astronomer. Long cherished visions of fame and high distinction, nay, perhaps of grand discoveries in the heavens, which for years had played round his hopes of the future, had fled forever. Another had reaped the golden harvest, and like Clairaut, who wept that there was not for him, as for Newton, the problem of the universe to solve, Sir James South could almost weep to think that another's eye had been permitted to sweep over the far distant realms of space which he had long hoped might remain his own peculiar province.

Such views seem very strange at this time, when, if one is absolutely certain of anything in this direction, it is that there is much more to do, even now, after the lapse of half a century, in every department of double star work, than there ever was before. The late Rev. T. W. Webb, author of *Celestial Objects for Common Telescopes*, one of the most eminent English amateur astronomers, in a letter written to me in 1873, after the publication of my first three catalogues, said: "It will hardly be possible for you to go on for any great length of time as you have begun, because the number of such objects is not interminable, and every fresh discovery is one less to be made; still, what you have already done is so much more than any man now living has accomplished, that your high position as an observer is fully secured." Since that time more than one thousand new double stars have been added to my own catalogues, and the prospect of future discoveries is as promising and encouraging as when the first star was found with the six-inch telescope. The gold medal of the Royal Astronomical Society was awarded in 1894 for these discoveries.

NEW STARS TO OLD PAIRS

As would be expected in discoveries of this kind, many of the old pairs recorded by the Herschels, the Struves, and other astronomers, have been found to be triple or quadruple, by the addition of much closer and more difficult components. This catalogue contains 133 stars of this



THE 6-INCH CLARK REFRACTOR, NOW AT THE WASHBURN OBSERVATORY, UNIVERSITY OF ALABAMA.

class, or more than one tenth of the whole number is made up of previously known doubles, where one of the components has been again divided, or a much nearer star added to the system. Most of these were difficult objects when discovered, and all of them much more difficult than the old stars. In this way some pairs, much too wide to be of any interest as double stars, have been shown by the discovery of the new star to be important binary systems, and among the most rapid known.

The following is a classified list of the pairs given in the several catalogues of the Herschels, the Struves, and South, which I have found to be more closely double:

W. STRUVE		W. STRUVE		HERSCHEL II		HERSCHEL I	
Σ	PAGE	Σ	PAGE	H	PAGE	H	PAGE
17	3	2130	155	1951	7	VI. 66	49
100	18	2268	171	2161	33	VI. 35	37
117	20	2287	173	2298	75	V. 25	61
157	24	2342	180	2638	123	V. 21	7
171	25	2476	188	2661	127	V. 91	73
258	30	2538	192	2710	133	VI. 75	63
524	34	2539	193	2807	160	III. 27	64
366	37	2549	194	3133	249	VI. 42	91
439	41	2557	195	3216	266	IV. 26	97
468	43	2704	212	3291	53	VI. 78	97
645	58	2793	229	3275	63	IV. 128	102
668	59	2816	233	3944	47	V. 124	130
687	61	2824	235	3760	64	III. 7	141
692	62	2959	254	3786	69	V. 6	148
797	63	3018	261	3875	81	III. 103	202
721	64	3047	267	1774	142	V. 95	244
734	66			4803	144	VI. 21	250
753	67	HERSCHEL II.		4935	162		
762	68			5000	170	SOUTH	
809	72	H	PAGE	5028	172	Σ	PAGE
888	77	307	95	5035	173	400	20
1026	85	607	204	5072	184	423	33
1057	87	998	271	5542	256	437	37
1097	89	1453	199	HERSCHEL I.		537	32
1179	96	1489	203			571	100
1780	128	1499	209	H	PAGE	625	14
1835	133	1554	214			668	103
2005	147	1828	252	V. 92	28		

General Catalogue of Double Stars

SOUTH		O. STRUVE		W. STRUVE (Appendix)	
Σ	Page	Σ	Page	Σ	Page
173	173	34	11	38 App. I	181
174	174	169	86	38 App. I	183
175	175	173	92	58 App. I	247
		24	117	12 App. II	257
		33	167		
SOUTH AND HERSCHEL		37	189	O. STRUVE (Appendix)	
		428	220	Wide Pairs	
		447	233	Σ	Page
	127			App. 12	17
	134	W. STRUVE (Appendix)		App. 38	41
		Wide Pairs		App. 77	79
179	134	Σ	Page	App. 177	180
233	169	14 App. I	65	App. 209	215
263	179	24 App. I	122	App. 215	225
274	179	24 App. I	124	App. 220	232
376	310			App. 234	245

NEW SKED-LYL DOUBEL STARS

In nearly one fourth of the whole number of stars found to be double, the primary is bright enough to be visible to the unaided eye. These stars, numbering altogether 291, are pretty well distributed among the different constellations visible in this latitude. Many of them are among the most prominent of the bright and well-known stars. To facilitate easy reference to these stars, when only the constellation name is given, I have arranged them under the heads of the constellations in which they are found.

β	STAR	Page	β	STAR	Page
	<i>Andromeda</i>			<i>Aquarius</i>	
1095	28 Andromedae	5	1034	7 Aquarii	219
151	6 Andromedae	9	73	β Aquarii	230
150	6 Andromedae	20	1212	24 Aquarii	232
141	2 Andromedae	253	172	51 Aquarii	244
717	8 Andromedae	259	178	Aquarii 252	252
04	W ² XXII. 590	262	1220	ϕ^1 Aquarii	257
995	6 Andromedae 4119	265	279	6 Aquarii	264

β	STAR	PAGE	β	STAR	PAGE
<i>Aquila</i>			<i>Cancer</i>		
287	ζ Aquilae	187	1065	β Cancri	98
653	μ Aquilae	193	<i>Canes Venatici</i>		
672	γ Aquilae	214	925	Groombridge 1938	121
<i>Argo</i>			930	B.A.C. 4380	123
755	Argus 34	81	608	17 Canes Ven.	124
757	Argus 101	86	<i>Canis Major</i>		
578	Lalande 14545	89	753	λ Canis Majoris	80
1061	κ Argus	91	328	Canis Majoris 139	85
1063	ξ Argus	92	329	Canis Majoris 146	85
101	9 Argus	92	<i>Canis Minor</i>		
1064	19 Argus	97	21	γ Canis Minoris	89
208	Lalande 17103	101	<i>Capricornus</i>		
<i>Aries</i>			294	3 Capricorni	204
522	μ Arietis	32	205	α^+ Capricorni	204
306	Arietis 307	32	60	π Capricorni	208
878	66 Arietis	39	61	ρ Capricorni	208
<i>Auriga</i>			668	B.A.C. 7080	210
554	ϵ Aurigae	57	<i>Cassiopeia</i>		
1046	9 Aurigae	57	1094	Lalande 655	5
888	σ Aurigae	62	231	α Cassiopeiae	10
1240	26 Aurigae	66	492	B.A.C. 201	10
192	τ Aurigae	70	497	B.A.C. 239	13
893	B.A.C. 1935	74	1095	ν^+ Cassiopeiae	13
901	65 Aurigae	87	1028	γ Cassiopeiae	13
<i>Bootes</i>			1099	B.A.C. 255	13
1111	B.A.C. 4766	133	306	B.A.C. 282	15
616	γ Bootis	135	1101	ψ Cassiopeiae	17
1086	47 Bootis	140	1103	11 Cassiopeiae	21
<i>Caelum</i>			513	48 Cassiopeiae	27
750	γ Caeli	58	783	49 Cassiopeiae	27
<i>Camelopardalis</i>			278	B.A.C. 5138	280
1043	3 Camelopardali	51			
1187	5 Camelopardali	55			

β	STAR	PAGE	β	STAR	PAGE
<i>Centaurus</i>			<i>Corvus</i>		
343	Centaur 202	129	1276	Lalande 22580	117
344	Centaur 205	135	920	Corvi 17	118
348	Centaur 212	136	605	Corvi 20	119
357	Centaur 230	138	1245	ζ Corvi	119
			28	B.A.C. 4213	120
<i>Cepheus</i>			<i>Crater</i>		
1116	48 Cephei (H)	37	220	Crateris 22	113
1134	D.M. 163, 2008	208	600	Crateris 36	114
1141	P.XXL 245	233	1078	Crateris 79	115
690	μ Cephei	237	<i>Cygnus</i>		
697	19 Cephei	240	1131	θ Cygni	195
742	δ Cephei	246	980	η Cygni	199
			660	B.A.C. 6963	204
<i>Cetus</i>			661	Cygni 160	205
486	Ceti 111	3	665	γ Cygni	207
490	ζ Ceti	8	669	ω Cygni	210
395	Ceti 82	9	675	51 Cygni	215
1101	B.A.C. 230	12	676	ϵ Cygni	216
114	Ceti 132	13	677	T Cygni	217
303	θ Ceti	20	1137	B.A.C. 7278	219
1093	Ceti 199	20	<i>Delphinus</i>		
399	Ceti 211	21	63	δ Delphini	209
7	58 Ceti	27	151	β Delphini	211
313	Ceti 389	31	298	α Delphini	214
84	W III 347	38	65	λ Delphini	217
<i>Coma Berenices</i>			<i>Draco</i>		
1936	17 Comae	126	791	O. Arg. N. 12149	116
3081	37 Comae	121	799	R 2963	124
112	P.XXII. 243	121	946	B.A.C. 5248	145
1033	P.XIII. 298	123	1088	μ Draconis	155
			1090	β Draconis	165
<i>Corona</i>			962	26 Draconis	166
1087	π Coronae	138	633	γ Draconis	168
			971	Draconis 205	183
			1255	B.A.C. 6476	185

β	STAR	PAR.	β	STAR	PAR.
<i>Equuleus</i>			<i>Hercules</i>		
71	γ Equulei	224	1195	τ Herculis	149
			625	ω Herculis	150
			816	31 Herculis	152
	<i>Eridanus</i>		818	32 Herculis	152
11	ρ^2 Eridani	36	627	52 Herculis	154
400	Eridani 103	37	954	54 Herculis	154
531	Lalande 6275	38	130	90 Herculis	155
744	Eridani 299	47	646	113 Herculis	154
811	Eridani 315	48			
881	46 Eridani	51	<i>Hydra</i>		
88	51 Eridani	52	587	15 Hydrae	102
			588	Hydrae 96	103
	<i>Fornax</i>		590	29 Hydrae	106
877	γ Fornacis	33	593	λ Hydrae	109
			1200	44 Hydrae	112
	<i>Gemini</i>			Lacaille 4360	112
1241	3 Geminorum	74	411	ϕ^2 Hydrae	119
1058	4 Geminorum	75	341	Hydrae 348	102
1008	η Geminorum	76	1246	B.A.U. 4740	112
1059	μ Geminorum	78	940	52 Hydrae	134
1102	ν Geminorum	79	230	59 Hydrae	139
571	W ² VI. 956	81			
1193	30 Geminorum	82	<i>Lacerta</i>		
1009	τ Geminorum	85	694	1 Lacertae 1	246
1194	65 Geminorum	89	723	9 Lacertae	247
200	70 Geminorum	90	451	15 Lacertae	252
580	β Geminorum	91	182	B.A.U. 7982	252
1062	82 Geminorum	92			
			<i>Leo</i>		
	<i>Grus</i>		105	κ Leonis	118
768	Lacaille 8964	258	1076	55 Leonis	111
771	σ^2 Gruis	248	598	59 Leonis	112
773	ν Gruis	253	599	65 Leonis	113
			1282	δ Leonis	113
			604	β Leonis	119

α	STAR	PAR.	β	STAR	PAR.
<i>Leo Minor</i>			<i>Ophiuchus</i>		
55	40 Leonis Minoris	110	626	ϕ Ophiuchi	151
			1117	24 Ophiuchi	154
	<i>Leporis</i>		1118	η Ophiuchi	158
346	Leporis 3	57	282	S. D. (14°) 4585	159
27	β Leporis	64	126	B.A.C. 5839	162
310	Leporis 45	68	1251	B.A.C. 5991	167
34	Leporis 61	72	1124	67 Ophiuchi	169
			1125	68 Ophiuchi	170
	<i>Libra</i>		637	W' XVIII. 28	172
106	μ Librae	137	<i>Orion</i>		
1085	Piazzi XIV. 229	139	553	σ Orionis	56
618	ϵ Librae	141	555	β Orionis	59
			188	τ Orionis	61
	<i>Lynx</i>		558	δ Orionis	65
557	Lynx 21	88	1048	Lalande 10437	65
			1032	σ Orionis	68
	<i>Lyræ</i>		1056	μ Orionis	74
172	Lyræ 28	180	96	75 Orionis	77
968	ξ Lyræ	181	<i>Pegasus</i>		
253	β Lyræ	183	685	2 Pegasi	230
648	B.A.C. 6480	185	989	κ Pegasi	234
			290	34 Pegasi	244
	<i>Microscopium</i>		1144	η Pegasi	250
776	2 Microscopii	228	718	64 Pegasi	260
777	Lacaille 8809	229	720	72 Pegasi	262
			733	85 Pegasi	268
	<i>Monoceros</i>		<i>Perseus</i>		
19	3 Monocerotis	74	874	5 Persei	28
17	4 Monocerotis	74	1170	χ Persei	29
206	Monocerotis 21	76	875	9 Persei	29
577	Monocerotis 23	76	521	Persei 67	32
57	11 Monocerotis	79	524	20 Persei	34
897	Monocerotis 97	82	526	β Persei	36
1268	24 Monocerotis	86	1179	34 Persei	39
112	P VII. 116	89	535	38 Persei	41
			1183	B.A.C. 1142	42

β	STAR	PAGE	β	STAR	PAGE
<i>Pisces</i>			<i>Serpens</i>		
302	Piazzi O. 245	14	348	2 Serpentis	139
303	Piscium 201	16	32	6 Serpentis	142
1029	ζ Piscium	18	619	Serpentis 55	144
1164	95 Piscium	21	<i>Taurus</i>		
506	η Piscium	22	544	36 Tauri	45
5	103 Piscium	23	547	47 Tauri	46
730	27 Piscium	267	87	Piazzi IV. 53	47
<i>Piscis Australis</i>			1186	Tauri 248	48
276	η Piscis Australis	239	550	α Tauri	49
772	δ Piscis Australis	253	551	96 Tauri	53
<i>Sagitta</i>			1045	99 Tauri	56
57	Lalande 38415	201	1007	126 Tauri	60
<i>Sagittarius</i>			1054	136 Tauri	72
283	B.A.C. 6088	169	<i>Ursa Major</i>		
245	Sagittarii 46	172	1067	\circ Ursae Majoris	99
292	μ Sagittarii	173	1071	θ Ursae Majoris	106
286	16 Sagittarii	174	1077	α Ursae Majoris	112
760	η Sagittarii	175	918	Lalande 22496	117
1033	ν^1 Sagittarii	184	919	W ⁺ XI. 1013	117
654	52 Sagittarii	193	1082	78 Ursae Majoris	122
1288	55 Sagittarii	196	<i>Virgo</i>		
763	κ^2 Sagittarii	206	923	Virginis 168	120
<i>Scorpio</i>			924	31 Virginis	121
36	2 Scorpii	145	920	48 Virginis	123
622	π Scorpii	146	932	Virginis 550	120
947	β Scorpii	140	612	B.A.C. 4559	127
39	11 Scorpii	147	935	86 Virginis	128
120	ν Scorpii	148	225	Lalande 26320	134
1116	B.A.C. 5600	153	<i>Vulpecula</i>		
416	Scorpii 185	160	248	2 Vulpeculae	192
<i>Sculptor</i>			1130	9 Vulpeculae	193
391	κ^1 Sculptoris	1	983	B.A.C. 6966	201
1013	δ Sculptoris	200	447	Vulpeculae 129	220
			767	Lacaille 8809	220

NEW BINARY STARS

All of the most interesting of the known physical pairs have small apparent distances, and are difficult objects when compared with those in slow motion. As these catalogues, commencing with the first, contained an unusual proportion of close pairs, it was evident that sooner or later they would contribute a large number of physical systems. This expectation has been realized, and to an extent which could hardly have been anticipated within the time covered by the observations. The extreme range of the measures is but little more than twenty-five years, and the greater portion of the micrometrical work commenced at a later date. There is little doubt that this catalogue will furnish far more binaries than are found in all the voluminous early lists. There is nothing remarkable in this when the character of the stars with respect to distance is taken into account. As already stated the old catalogues contain a large proportion of very wide couples, where the distance between the components is much too great to make any physical connection between them at all probable. But it must be remembered that at least some of the instruments used by these observers could not compare favorably with modern refractors, and particularly with telescopes made by the Clarks; and even when those observers had had more powerful instruments in point of light-gathering power, as in the case of the Herschels, there can be no doubt that they were far inferior in definition, and in every practical respect for observations of this kind, to the 6-inch refractor with which so much of my work has been done. A glance at the list of old pairs to which new and more difficult components have been added will be sufficient on this point. I have shown in the appendix to my *Thirteenth Catalogue* that my several lists which had been published at that time include more double stars of Class I (where the distance does not exceed $1''$) than all of the various catalogues of both Herschels and both Struves, notwithstanding the fact that the works of these eminent astronomers contain altogether not less than 7400 double stars.

It is only among the very closest pairs that rapid binaries are found, and it is certain that when the very close pairs, and particularly those discovered with the 36-inch, are fully observed, many wonderful systems of short periods will be brought to light. It is unfortunate that there are not more telescopes in the world powerful enough to take part in the work of reobserving these difficult pairs. But few short-period binaries are yet known. In all the old catalogues above referred to, there are but six whose orbits have been computed where the periodic time is less than fifty years. This catalogue contains not only the binary of the shortest known period, but it has several with periods of less than thirty years; and this number will be largely augmented when many of the stars known to be rapidly changing have been more fully measured.

The list of binary and probably binary stars which is given in this general catalogue must be regarded as only provisional. For many of the stars, and particularly the later discoveries, the evidence is insufficient when the relative motion is not rapid. Most of the pairs in the binary list are placed there because of the change, more or less rapid, shown by the micrometrical measures. In a few instances this may be the result of proper motion, but in the great majority of cases it is true orbital motion. A few examples are also included where the primary has a well determined proper motion, which the measures show is common to both stars. This fact sufficiently establishes a physical relation between the components, although the relative motion may be very small.

In the following table I have classified the stars in the order of their numbers. In these cases the evidence seems to warrant the conclusion that they are probably physical systems. For the numbers marked with a * orbits have been computed.

β	PAGE	β	PAGE	β	PAGE	β	PAGE
4	19	237	129	608	124	862	271
5	23	239	139	612*	127	870	24
7	27	274	226	620	144	874	28
16	74	279	264	625	150	877	33
17	74	281	271	627	154	878	39
28	120	286	174	631	166	883*	53
31	138	287	187	633	168	886	61
32	142	290	244	637	172	894	76
35	144	291	248	639	176	895	77
36	145	302	14	641	177	897	82
39	147	320	64	648	185	901	87
63	209	348	139	658	197	911	108
64	215	397	218	668	210	924	121
75	238	382	252	670	211	929	123
79	258	395	6	675	215	932	126
80	259	416*	160	683	220	935	128
83	32	450	115	696	240	946	134
101*	92	491	9	701	245	947	146
105	105	513	27	710	250	953	153
106	137	524	34	711	251	962	166
113	120	525	38	717	259	971	183
117	135	531	38	718	260	989*	234
120	148	533	40	720	262	992	255
130	168	535	41	730	267	996	266
132	173	539	42	733*	268	999	28
142	191	543	44	741	35	1005	22
148	198	547	46	753	80	1006	45
151*	211	550	49	766	175	1007	60
152	216	552	54	766	228	1008	70
163	226	555	59	769	241	1009	85
172	244	560	71	785	28	1013	260
182	258	581	95	791	116	1022	84
232	12	587	102	820	125	1028	11
205	99	599	169	816	132	1029	18
208	101	599	113	823	155	1031	49
235	17	603	116	858	204	1032	68

α	δ	β	PAR.	β	PAGE	β	PAGE
1054	2.6	1087	148	1117	154	1179	39
1058	1.28	1088	555	1118	155	1212	232
1061	1.7	1089	195	1125	170	1220	257
1067	2.6	1090	105	1131	195	1240	66
1055	5.3	1092	249	1146	251	1241	74
1057	7.5	1095	8	1147	255	1249	132
1067	29	1096	14	1163	20	1281	167
1071	1.60	1104	19	1164	21	1260	207
1077	1.6	1105	23	1174	30	1266	261
1082	1.2	1111	133	1176	37	1281	110
1085	1.9						

QUADRUPLE STARS

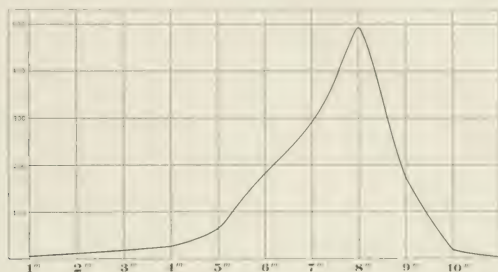
This catalogue furnishes a number of examples of double-double stars, of the ϵ *Lyrae* type, but with the pairs separated by a much smaller distance. Strictly speaking ϵ *Lyrae* should not be called a quadruple star, as the distance between the pairs renders it almost, if not quite, certain that they can have no physical relation, unless it is assumed from a small common proper motion. It is probable that many of the examples selected from this catalogue, although the distances are very much less, are too widely separated to give any presumption in favor of their belonging to one system. Of course, two double stars would be on no better footing, so far as this question is concerned, than two single stars within the same distance.

The distance between ϵ^1 and ϵ^2 *Lyrae* is about $207''$. In the following list none of the stars have more than half that distance, and in most instances the component pairs are much closer. They are arranged in the order of the separating distance.

β	AB	CD	A AND C	PAR.	β	AB	CD	A AND C	PAR.
077	1.7	1.7	11.1	166	12	0.7	1.8	41.1	148
304	0.6	5.1	12.2	222	886	17.6	0.8	48.5	91
7240	2.5	3.3	14	229	366	1.2	1.4	59.7	27
719	0.1	8.1	17.1	176	285	1.6	2.0	60.1	175
935	1.6	2.6	27.1	128	876	1.2	6.2	70.7	30
836	0.8	1.1	27.4	123	566	0.7	1.2	72.0	136
1101	2.9	0.9	27.4	19	321	0.8	1.4	89.3	68
141	0.8	3.9	28.7	190	898	3.6	1.8	97.2	83
1049	0.6	3.6	29.2	63	1262	0.6	3.9	103.8	169

DISTRIBUTION IN MAGNITUDES

The following diagram shows the distribution of these pairs in magnitudes. The magnitude on the lower part of the diagram is of course that of the primary to the nearest whole number. As would be expected the maximum is reached at the eighth magnitude. A map showing the distribution in the heavens of the first one thousand double stars is given in my *Thirteenth Catalogue*.



REJECTED DOUBLE STARS

The numbers mentioned below are not given in this *General Catalogue*, as they are identical with pairs found in other and prior works.

320 = H 1218	β 562 = OΣ 122
58 = Σ 2629 rej.	594 = OΣ 216
99 = Σ 1207 rej.	644 = H 864
110 = H 2036	667 = Σ 2656
187 = Dembowski	737 = O. Stone
302 = OΣ 106	1038 = OΣ 510
444 = Omitted number	1057 = OΣ 120

UNPUBLISHED MEASURES

I am under deep obligations to many well-known double-star observers in this country and in Europe for unpublished measures of these stars. This catalogue contains several thousand observations which have never been printed elsewhere. The following astronomers have kindly furnished me with most valuable material for this work:

AITKEN, Lick Observatory.
 BARNARD, Yerkes Observatory.
 BROWN, Naval Observatory.
 CHRISTIE, Greenwich Observatory.
 COGSALL and BOOTHROYD, Lowell Observatory.
 DOOLITTLE, Flower Observatory.
 HUSSEY, Lick Observatory.
 SEE, Naval Observatory.
 SCHIAPARELLI, Royal Observatory, Milan.
 STRUVE, H., Universitäts Sternwarte, Königsberg.
 WILSON, Goodsell Observatory, Northfield, Minn.

When it was finally arranged to publish this catalogue, it was evident that its value would be greatly increased by giving, as far as practicable at this time, a complete history of each pair, so that the change, or absence of relative motion, could be fairly inferred in all pairs from the measures given. There were many pairs, and particularly among those discovered at the Lick Observatory from 1888 to 1892, which had not been re-observed, and therefore nothing was known concerning them as to the question of motion. In other instances there were no very recent measures, and the earlier observations were not sufficiently numerous, or extended in point of time, to show the character of the relation between the components. In order to supply these needed observations, I prepared and sent to Aitken, of the Lick Observatory, from time to time, special lists of these objects, which included the closest and most difficult stars to measure in the entire catalogue, and requested him to undertake their measurement with the 36-inch. These lists also included some pairs which had apparently become single from rapid motion, and others of a more or less doubtful character. This request received a hearty response, and he entered upon the work with enthusiasm and zeal, and has contributed results which, without his assistance, would be wanting here. I wish to record here my high appreciation of the great value and accuracy of these measures. Other measures have been made by the same observer while this catalogue was passing through the press, but received too late for insertion in their proper places, and these, with measures by other observers, will be given in a supplement at the end of this work. His last published series of measures in *A.N.* 3585, giving the observations of 1898, was received in printed form after a considerable portion of this work was in type. The measures are all given in this catalogue, but only those after R.A. $17^{\text{h}} 10^{\text{m}}$ are referred to by the above *A.N.* number.

Lists of other stars were sent to Brown, of the Naval Observatory; to Doolittle, of the Flower Observatory; to the observers of the Lowell Observatory, and to Wilson, of the Goodsell Observatory, and their valuable results are given in this catalogue. Doolittle has measured a large number of pairs with the 18½-inch. These will soon be published in Vol. I. of the *Publications of the Flower Observatory*, and they are therefore cited in the references in this way. I am also indebted to the Astronomer Royal of Great Britain for a large number of measures of close and difficult pairs, made principally by LEWIS, BOWYER, BRYANT and DYSON, with the 28-inch of the Royal Observatory at Greenwich.

The unpublished measures of Schiaparelli with the 18-inch refractor of the Royal Observatory embrace a large number of objects, altogether more than 1200 measures, and cover a period of not less than ten years. It is unnecessary to say that the measures of this distinguished observer are of the highest value.

The unpublished measures by See were made during his connection with the Lowell Observatory with the 24-inch, and, like the subsequent observations of Cogshall and Boothroyd at the same place, are principally of southern pairs. The observations by H. Struve were made with the 30-inch Clark refractor, at Poulkova, about 1885, while he was connected with that Observatory; and those by Hussey with the 36-inch at the Lick Observatory.

My own unpublished observations with the 40-inch have already been referred to. The work with this instrument also includes measures by BARNARD of special objects of interest, of which some will be found in the supplement.

PROPER MOTIONS

As far as practicable I have given the proper motions of all the stars in this catalogue where the value has been deduced from meridian observations. A knowledge of this movement has an important bearing in determining the question of physical relation. Where the components are moving together in space, there can be but little doubt of their forming binary systems, although

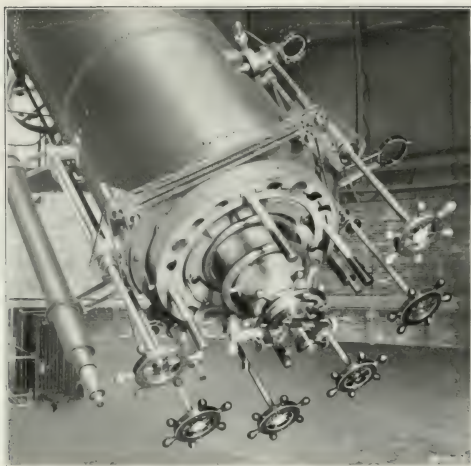
the relative change may be insignificant in the comparatively short time covered by the observations. In this examination I have given the first place to the investigations of Auwers as found in his *Catalogue of the Bradley Stars, Fundamental Catalogue*, and contributions on this subject in the *Astronomische Nachrichten*, and other publications. The new catalogues of the *Astronomischen Gesellschaft* have furnished the proper motions of a good many of the lower magnitudes. Other material has been obtained from the Greenwich, Radcliffe, Cape, Cincinnati, and other catalogues, and also from the recent works of Kustner, Bossert, and others. Porter, of the Cincinnati Observatory, has furnished information concerning many stars which appeared from the micrometrical measures to have some rectilinear movement, and which had not been recognized heretofore in the meridian observations.

I am specially indebted to Professor George E. Hale, Director of the Yerkes Observatory, for his hearty assistance and coöperation in the prosecution of the work at this Observatory, and in its preparation and publication.

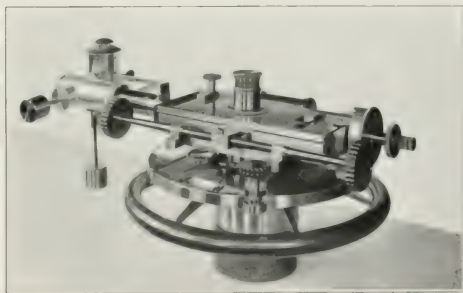
This volume in printed form owes its existence to the interest and liberality of that generous patron of astronomical science, Miss Catherine W. Bruce, of New York City. Her large gifts in aid of original research, in providing instruments and means for the prosecution of work, and the publication of observations and investigations, have been widely distributed, not only in this country, but abroad. The results already achieved in widely different fields are of the highest importance, and with the results yet to follow in the near and in the far future, will form a monument to the memory of this benefactor of Astronomy, which will endure for all time.

S. W. BURNHAM.

Chicago, December 6, 1899.



EYE END OF THE 40-INCH TELESCOPE OF THE YERKES OBSERVATORY



MICROMETER OF THE 40-INCH TELESCOPE

MADE BY KROGG & COMPANY

ABBREVIATIONS.

Most of the abbreviations of observers and publications used in the measures will be readily understood from the references given at the end of each double in the catalogue. The following only need a further explanation :

- A. N.* *Astronomische Nachrichten.* In the references, the Arabic figures in parenthesis, without other designation, following the name of the observer, *e. g.*, β (3114), indicate, in all cases, the number of the *A. N.* in which the observation is made.
- β^1 *Double Star Observations made in 1877-8 at Chicago, with the 18½-inch refractor of the Dearborn Observatory, comprising: I. A catalogue of 251 new double stars with measures; II. Micrometrical measures of 500 double stars. Memoirs of the Royal Astronomical Society, Vol. XLIV.* (This volume contains my *Tenth Catalogue*.)
- β^2 *Report to the Trustees of the James Lick Trust, of observations made on Mt. Hamilton, with reference to the location of the Lick Observatory, 1879.* (This contains the *Eleventh Catalogue* and measures of other stars. It is reprinted in *Publications of the Lick University*, Vol. I.)
- β^3 *Double Star Observations made in 1879-80 with the 18½-inch refractor of the Dearborn Observatory. I. Catalogue of 151 new double stars with measures. II. Micrometrical measures of 770 double stars. Memoirs R. A. S., Vol. XLVII.* (*Thirteenth Catalogue*.)
- β^4 *Publications of the Washburn Observatory, Vol. I.* (*Twelfth Catalogue*, and measures of other stars.)
- Cin³, Cin⁴, etc. *Publications of the Cincinnati Observatory, Nos. 3 to 6.* (Measures of double stars by Stone, Howe, Upton, and Egbert, from 1875 to 1880. No. 10 of this series contains measures by Wilson.)
- d* Dembowski.
- d* (I) *Misure Micrometriche di Stelle Doppie e Multiple fatte negli anni 1852-1878 dal Barone Ercole Dembowski.* Roma 1883. (Vol. I contains the measures of β stars; Vol. II the Struve stars.)
- Glasenapp (I, II, III, IV, V) } The Roman numerals refer to the five series of micrometrical measures made by the Director of the Observatory of the Imperial University of St. Petersburg, and published from 1892 to 1899.
- H^{*} Sir William Herschel.
- H⁺ Sir John F. W. Herschel.
- Hall (I) *Observations of double stars made at the U. S. Naval Observatory by Asaph Hall. Appendix to the Washington Observations for 1877.* (Measures with the 26-inch 1875-1879.)
- Hall (II) *Observations of double stars made at the U. S. Naval Observatory 1880-1891 by Asaph Hall. Appendix to Washington Observatory for 1888.*
- I. M. *Publications of the Micrometrical Observations of the Lick Observatory, Vol. I, Part 4.* (Measures of double stars with the 26-inch refractor in 1885-6 by F. P. Leavenworth and Frank Muller.)

- 1871) *Measurements of Double Stars made at the Harvard College Observatory*
 by F. F. Leavenworth. (Measures in 1888 with the 10-inch Clark refractor. A few of
 the measures by student assistants.)
- Sp (II) *Osservazioni Stelle Doppie 1875-1885 da G. V. Schiaparelli.* Milano, 1888. (A prior
 series of measures of the Struve stars was published in 1882.)
- Sp (III) Unpublished measures by Schiaparelli, made at Milan, 1889-1898.
- Wilson (Cin.¹⁰) *Publications of the Cincinnati Observatory* No. 10. (Double star measures 1882-1886, principally
 by H. C. Wilson. The unpublished measures by the same observer were made with the
 16-inch of the Goodsell Observatory, Northfield, Minn.)

*A General Catalogue of the Double Stars discovered by
S. W. Burnham from 1871 to 1899, arranged in
order of Right Ascension.* By S. W. BURNHAM.

β 1155. D.M. (3) 4932

R.A. 6^h 67^m 26^s }
Decl. + 37° 30' }

1890.82	90.4	0.44	8.7	...	0.3	3 ^m	β
1898.04	91.1	0.42	8.7	...	0.0	2 ^m	A

Discovered with the 36-inch. Apparently without change.

[β (xvii)...β (3047)...β (*Pub. L. O. II.*)...Aitken ()...]

β 1014. Lalande 47287

R.A. 6^h 17^m 23^s }
Decl. + 31° 30' }

1882	340	2	7	...	1.2		β
1891.70	335.9	1.55	7.0	...	1.2	3 ^m	β
1897.94	304.1	1.15	...	...		3 ^m	L.
1898.65	337.4	1.55	7.0	...	1.3	2 ^m	β

Discovered with the 18½-inch. Probably no relative change. According to PORTER this star has no appreciable proper motion.

[β (xiii)...β³ (app)...β (3113)...β (*Pub. L. O. II.*)...
Lewis (*Mon. Not. LIX*, 400)...]

β 483. Lalande 17315

R.A. 7^h 29^m 57^s }
Decl. + 34° 40' }

1878.66	44.7	2.37	7.5	...	11.8	1 ^m	β
1885.83	44.0	3.09	...	...		2 ^m	11Σ
1891.70	44.1	2.95	7.0	...	11.7	3 ^m	β
1898.84	42.7	3.03	7.5	...	10.7	2 ^m	β

Discovered with the 18½-inch. One of a wide pair. Probably unchanged.

[β (x)...β²...β (3113)...β (*Pub. L. O. II.*)...11Σ ()...]

β 391. κ' *Sculptoris*

R.A. 6^h 37^m 14^s }
Decl. — 28° 34' }

1876.79	97.2	0.78	6.0	...	6.2	1 ^m	Cin
1877.74	97.1	0.87	6.2	...	6.3	3 ^m	Cin
1888.88	92.5	0.94	6.1	...	6.1	6 ^m	Lv
1892.88	88.0	0.75	6.1	...	6.1	2 ^m	Gl
1893.91	91.0	0.74	6	...	6	2 ^m	Sel
1894.94	92.0	0.94	...	...		3 ^m	Sel
1895.83	91.0	0.93	...	...		3 ^m	A
1895.85	91.0	0.98	...	...		3 ^m	Scott
1897.07	93.5	1.24	6.4	...	6.4	3 ^m	See
1897.95	271.2	1.11	6.3	...	6.3	2 ^m	Scott
1898.69	270.1	1.29	7.0	...	7.2	2 ^m	Ed

Discovered with the 6-inch. The measures do not show any certain change.

[β (vii)...β (2103)...Cin²...Cin⁴...Lv¹...Glasenapp (ii)
Sellers (34203303)...Scott (*Brit. Ast. Ass.* VI, 308)
Mon. Not. LIX, 427. Aitken (1885). See page 11.
Barnard () ()]

β 484. D.M. (11) 11

R.A. 7^h 29^m 57^s }
Decl. + 34° 40' }

1878.66	150.3	1.98	7.7	...	11.0	2 ^m	β
1885.74	154.7	3.00	...	...		2 ^m	11Σ
1891.70	153.0	3.11	7.7	...	11.7	3 ^m	β
1894.77	150.1	3.80	7.0	...	11.8	3 ^m	β

Discovered with the 18½-inch.

[β (x)...β²...β (1113)...β (*Pub. L. O. II.*)...
11Σ ()...]

β 486. *Ceti* 33R.A. $6^{\text{h}} 58^{\text{m}} 19^{\text{s}}$
Decl. $-8^{\circ} 27'$

1877.87	4.3	...	5.5...	10.0	1M	Cin
1878.54	5.2	2.81	6.0...	12.0	4M	β
1879.76	6.3	3.05	5.8...	10.5	2M	Cin
1886.86	3.4	3.31	6.0...	11.5	2M	1. M
1888.91	5.3	3.09	5.0...	11.0	1M	β
1898.68	8.8	3.13	5.7...	11.5	2M	Bd
1898.78	2.9	3.03	6.2...	12.0	1M	C ₂

Discovered with the 18½-inch. Apparently fixed. This star (= L 158) is 6 m in ARGELANDER and HEIS.

[β (X)... β^1 ... β^2 ... β^3 ... β (2959)... β (Pub. L. O. 11)...
Cin⁴...Cin⁵...LM...Boothroyd and Cogshall ()...]

 β 1027. D.M. (20) 115R.A. $0^{\text{h}} 58^{\text{m}} 44^{\text{s}}$
Decl. $+20^{\circ} 53'$

1888.92	186.8	1.54	7.2...	10.3	3M	β
1891.85	187.4	1.55	7.7...	11.5	3M	β
1895.90	180.5	1.38	...	...	1M	L
1897.89	180.9	1.62	...	...	3M	A

Discovered with the 36-inch. This star is W*O. 200.

[β (XIV)... β (2875, 3113)... β (Pub. L. O. 11)...Lewis (Mon. Not. LV1, 359) (Greenwich Obs., 1895)...Aitken (A.J. 120)]

 β 487. W*O. 241R.A. $6^{\text{h}} 10^{\text{m}} 18^{\text{s}}$
Decl. $+28^{\circ} 28'$

B and C

1878.25	265.4	2.04	...	12.5	2M	β
1891.64	266.5	2.39	...	11.5	2M	β
1898.72	266.2	2.54	...	11.5	2M	β

A and B (= Σ 17)

1828	20.4	2.0	8	0.1	1M	H
1830.05	24.3	2.033	8.8	0.2	2M	Σ
1847.43	29.2	2.685	...	...	2M	M ₁
1866.17	29.6	2.676	7.8	0.2	3M	β
1878.77	28.9	27.00	...	...	1M	β

1891.64	29.4	26.05	8.1	...	2M	β
1892.96	29.5	27.17	8.0	9.2	2M	C ₂
1893.72	29.5	26.88	8.2	...	2M	β

The companion to B was discovered with the 18½-inch. There appears to be no change in the components of Σ 17. The foregoing are all the measures of AB.

[β (X)... β^1 (3113)... β^2 (2959)... β (Pub. L. O. 11)... β (Mon. Not. Astro-Physics XII, 16)...Maddler (Fixstern-System II)...
Herschel (Mon. R. A. Soc., 2116)...Greenwich (11)...]

 β 392. B.A.C. 16R.A. $4^{\text{h}} 10^{\text{m}} 41^{\text{s}}$
Decl. $+60^{\circ} 52'$

1879.70	68.6	19.38	6.0...	12.0	2M	β
1888.71	68.2	19.80	6.5...	12.5	3M	β
1898.71	69.1	19.70	6.1	...	2M	β

Discovered with the 6-inch. Probably fixed.

[β (VII)... β^1 ... β (2103, 2875)... β (Pub. L. O. 11)...]

 β 776. D.M. (49) 140R.A. $10^{\text{h}} 10^{\text{m}} 52^{\text{s}}$
Decl. $-49^{\circ} 58'$

1881.59	202.5	0.90	8.8	...	0.13	3M	β
1888.88	202.0	1.11	8.8	...	9.2	3M	Com

Discovered with the 15½-inch at the Washburn Observatory. So far no evidence of change.

[β (XIV)... β (Mon. Not. Washburn Obs., 31)...]

 β 303. Lalande 224R.A. $12^{\text{h}} 12^{\text{m}}$
Decl. $-20^{\circ} 18'$

1877.87	6.2	0.9	7.0...	8.0	1M	Cin
1879.75	11.4	0.77	6.0...	8.0	3M	Cin
1886.81	12.6	7	8	...	1. M	
1890.89	16.0	0.71	7.5...	8.3	3M	β
1893.91	12.2	0.59	7	...	2M	S ₁
1897.71	18	0.32	...	...	1M	See
1898.68	12.5	0.69	7.5...	8.0	1M	β
1898.69	10.8	0.80	7.0...	8.5	1M	β

Discovered with the 6-inch. Probably unchanged.

[β (VII)... β (2103, 3048)... β (Pub. L. O. 11)...Cin⁴...Cin⁵...
Sellers (3240)...See (3495)...Cogshall ()...]

β 250. - 3 14 15

NA	18	1
FC	18	1

1878.9	24.1	2.5	10.0...	10.5	30	J
1878.74	240.0	2.43	8.3...	8.8	20	Gr
1886.70	248.4	2.70	8.8...	9.1	20	LM
1893.81	250.0	2.70	9.0...	10.2	20	W
1898.72	25...	2.8...	9.0...	9.2	10	Bd

Discovered with the 9.4-inch at the Dartmouth College Observatory. Evidently without change. The magnitude in S. D. is 8.

[β (v)... β (*Mem. Not.* xxxv, 31)... β (t)...Cin⁴...Cin⁶...
LM...Wilson ()...Boothrovd ()...]

β 1015. Lalande 368

Decl. + 11 30 0

1888.56	144.8	0.49	8.0... 8.0	10	Ly
1891.64	140.6	0.52	8.4... 8.6	20	β
1897.86	110.4	0.40		10	Bow
1897.93	112.0	0.46		10	l.
1897.99	125.4	0.51		20	Br
1898.86	124.0	0.48		30	Bow
1898.89	118.5	0.51		10	l.

Discovered with the 18½-inch. Probably un-
changed.

and Bowyer (*Mon. Not.* LIX, 400)...Brown (),]

β 1093. *Leptostichus* 375

10. A 11. A
12. 13. Y

1889.65	54.3	0.66	7.8	8.2	3H	β
1890.98	49.1	0.25			3H	β
1895.88	46.3	0.2			1H	β
1895.90	42.0				1H	L
	39.8	0.3			1H	L
1897.96	49.2	0.50			1H	L
1898.71	55.5	0.66	7.5	8.2	3H	Bd
1898.84	61.4	0.44	0.5	8.2	1H	β
1898.88	60.0				1H	L

Discovered with the 36-inch. The f one of three bright stars.

[β (xvi)... β (2956)... β (*Pub. L. O. II*)...Sp. (III)... Lewis
(*Mon. Not.* LVII, 359; LIX, 400) (*Greenwich Obsn.* 1895)
...Beethroyd ()...]

β 777. D.M. (1) 32

R.A. $0^{\text{h}} 14^{\text{m}} 56^{\text{s}}$
Decl. $-0^{\circ} 55'$

1881.73	166.7	4.20	8.5 . . . 9.5	3 <i>n</i>	β
1886.86	166.6	3.91	. . .	2 <i>n</i>	UL
1888.32	166.2	3.98	8.7 . . . 9.8	3 <i>n</i>	Com
1891.83	166.0	4.08	8 . . . 10	3 <i>n</i>	Col
1898.69	167.2	3.89	8.2 . . . 8.8	3 <i>n</i>	Bd

Discovered with the 15 $\frac{1}{2}$ inch of the Washburn Observatory. Apparently fixed.

[β (xii)... β^4 ...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...Collins (*Pub. Haverford Coll. Obsy.* 1891)...Boothroyd ()...]

β 488. Lalande 165

Re A.	0	17.5	52.5	100
Dev.	1	8	30	100

1878.40	347.9	3.32	7.5 . . . 10.5	4H	β
1886.74	347.2	3.40	7.6 . . . 10.9	7H	L.M.
1893.81	347.3	2.90	7.2 . . . 11.0	2H	W
1898.71	346.7	3.07	7.4 . . . 10.6	4H	Cg

Discovered with the 18 $\frac{1}{2}$ inch. Probably unchanged.

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[beta(x) = beta...LM, Glasenapp (11), Wilson (1), Cog
shall ( ),...]

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β 489 D. M. (13) S.

R.A. $0^{\text{h}} 19^{\text{m}} 40^{\text{s}}$
Decl. $+13^{\circ} 31'$

1878.43	182.5	3.32	8.0...	12.0	3 <i>n</i>	β
1891.64	180.4	3.35	8.3...	11.5	2 <i>n</i>	β

Discovered with the 18½-inch. No indication of motion.

$$[\beta^0(x), \beta^1, \beta^2, \beta^3, \beta^4(1112), \beta^5(I'u^k, I, O, 11) \dots]$$

β 778. D. M. (51) 72

R.A. 6^h 19^m 45^s
Dec. + 51° 16'

1881.61	47.9	1.65	9.5 . . . 9.5	3 μ	β
1888.37	45.6	1.24	9.2 . . . 9.3	4 μ	Com

Discovered with the 15½-inch of the Washburn Observatory. Motion doubtful.

[θ (xii)... θ^4 ...Comstock (*Pub. Washburn Obsy.*, vi)...]

β 1156. D.M. 663 + 48

R.A. $\alpha^{10} 19^m 58^s$ ϵ
Decl. $+\ 63^\circ 49'$

1890.74 31.9 0.52 9.2 ... 0.3 30 β

Discovered with the 36-inch in examining the place of TYCHO BRAHE's star.

[β (XVII)... β (3047)... β (*Sid. Mess.* IX, 449)... β (*Pub. L. O.* 11)...]

 β 1225. W.O. 446

R.A. $\alpha^{10} 27^m 55^s$ ϵ
Decl. $+\ 26^\circ 29'$

1891.85 189.3 1.15 8.1 ... 11.8 30 β
1898.90 187.5 1.39 ... 20 Bar

Discovered with the 36-inch. The magnitude in D.M. is 7.3.

[β (XVIII)... β (3113)... β (*Pub. L. O.* 11)...Barnard ()...]

 β 779. Lalande 542

R.A. $\alpha^{10} 21^m 37^s$ ϵ
Decl. $+\ 22^\circ 55'$

1881.67 204.3 0.84 8.5 ... 9.0 30 β
1887.80 200.1 0.87 8.4 ... 9.2 30 Com
1897.75 253.6 1.18 8.0 ... 9 30 D

Discovered with the 15 $\frac{1}{2}$ -inch of the Washburn Observatory. Some change is probable.

[β (XII)... β Comstock (*Fl. H. Comstock* 1893, 50). Little (*Pub. Flower Obs.* 1)...]

 β 1157. D.M. 663 + 52

R.A. $\alpha^{10} 22^m 30^s$ ϵ
Decl. $+\ 63^\circ 55'$

1890.74¹ 90.2 1.66 8.4 ... 11.3 30 β
1897.76 84.2 1.84 8.4 ... 11 30 D

Discovered with the 12-inch; near β 1156. The magnitude is 8.0 in D.M.

[β (XVIII)... β (3047)... β (*Sid. Mess.* IX, 449)... β (*Pub. L. O.* 11)... β (*Flower Obs.* 1)...]

 β 1094. Lalande 655

R.A. $\alpha^{10} 23^m 40^s$ ϵ
Decl. $+\ 54^\circ 19'$

1889.53 244.6 0.70 5.7 ... 9.5 30 β
1897.90 240.3 0.79 ... 10 A

Discovered with the 36-inch. This is a naked-eye star in *Cassiopea*.

[β (XVI)... β (2956)... β (*Pub. L. O.* 11)...Aitken (*A. J.* 429)...]

 β 1095. 28 *Andromedae*

R.A. $\alpha^{10} 23^m 47^s$ ϵ
Decl. $+\ 29^\circ 55'$

1889.51 0.1 2.42 5.5 ... 13.3 30 β
1898.73 1.8 2.34 6.0 ... 13.5 30 β

Discovered with the 36-inch. The principal star has an annual proper motion of 0'.061 in the direction of 159°.8, according to AUWERS. The effect of this movement would decrease the position angle of B 3°.8, and increase the distance 0'.53 in the interval covered by the foregoing measures. The change shown by the measures is in the reverse direction, indicating common proper motion.

[β (XVI)... β (2956)... β (*Pub. L. O.* 11)...]

 β 394. Lalande 658

R.A. $\alpha^{10} 24^m 30^s$ ϵ
Decl. $+\ 49^\circ 52'$

1876.77 278.0 0.83 8.2 ... 8.4 30 J
1885.74 278.5 0.97 8.4 ... 8.2 30 HZ
1888.68 281.5 1.08 8.0 ... 8.2 30 T
1893.54 280.1 1.06 8.0 ... 8.3 W

Discovered with the 6-inch. Probably unchanged.

[β (VII)... β (2103)...J (1)...Tarrant (2001)...W... HZ ()...]

 β 107. D.M. 662 + 43

R.A. $\alpha^{10} 24^m 31^s$ ϵ
Decl. $+\ 42^\circ 41'$

1873.68 278.0 0.83 8.2 ... 8.4 30 J
1881.52 278.5 0.97 8.4 ... 8.2 30 HZ
1888.72 281.5 1.08 8.0 ... 8.2 30 T

Discovered with the 6-inch. About 25" n of δ Cassiopeiae.

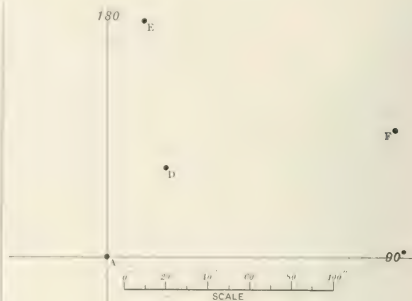
It would be assumed in the first instance that any change in a pair of very small stars, separated by so great a distance, would be due to the proper motion of one or the other. In this instance the two sets of measures give an apparent annual movement of the companion of $0'.18$ in the direction of $337^\circ.3$. Carrying this back to 1873, the smaller component at that time would be $1'.87$ from the primary in the position-angle of $37^\circ.7$. This agrees well enough with the estimated places so far as distance is concerned, but the agreement with the estimate of the angle is not very satisfactory. It is more difficult to judge of the direction of one star from another in high northern declinations, unless special care is taken, and this may explain the large error, if this is an error. In addition to this, allowable errors in the measure would change the direction of motion and give a much smaller position-angle for 1873. The probabilities are that the movement is rectilinear, and due to the proper motion of one of the stars, but of course there is nothing to indicate which one is drifting, beyond perhaps a slight presumption in favor of the brighter. The difference in magnitude, however, is too small to make this of much importance.

At the time of finding this pair, I assumed that it was D.M. (62^d) 93 from its situation with reference to two stars of similar magnitude, in the same field and nearly south of the double, which appeared to be Nos. 94 and 95 of that catalogue.

Since making the last measure, showing change in the components, I have more carefully examined ARGELANDER, and find that the stars in the D.M. do not correspond at all to the present positions of the stars in this vicinity. In order to compare the two accurately, I have connected the four principal stars in the field with A of the double by micrometrical measures. The results are as follows:

AC	1898.73	336.2	46.95	...8.2	2H
AD	1898.73	146.6	50.27	...8.3	2H
AE	1898.76	171.2	113.78	...8.5	1H
AF	1898.76	113.9	150.44	...8.7	1H

There are many small stars in the field, but all too faint for the D.M. These five stars are laid down to scale on Fig. 1 from the above measures. The four stars given in ARGELANDER (Nos. 93 to 96) are plotted on the same scale, and shown in Fig. 2.



It will be seen that it is impossible to identify the stars in one diagram with those of the other, except that E and No. 95 are probably the same. All of the stars in Fig. 1 are entitled from their magnitude to a place in the D.M. It is evident that there has been a great change in the relation of these stars since the meridian observations of ARGELANDER, or that there are very considerable

errors in the D.M. places of two or more of them. I have found it necessary, in the past twenty-five years, to compare the D.M. catalogues with the sky in the identification of small stars many hundreds of times, and I do not recall at this time any instance of serious error or omission. I have, therefore, a high degree of confidence in the substantial accuracy of this great work. Unfortunately, the new catalogues of the *Astronomischen Gesellschaft* are very defective with respect to the D.M. stars in the lower magnitudes. Of the first hundred stars given in the D.M. zone of 62° , less than one-third are found in the new catalogue covering this region, and all the stars in question are missing. So far as I know there are no meridian observations of them other than those in ARGELANDER, and hence there is no data for determining their previous relations to each other, and their proper motions. For this reason I have connected them together by the measures given above, so that hereafter the moving star or stars can be easily identified. It is certain that one of the components of the pair is moving, and there can be but little doubt of this being rectilinear motion; but that does not appear to be sufficient to entirely explain the difference between the two diagrams.

[34011] 3 *Mon. Not. Astr. Soc.* 3 (111) 5 (*Pub. L. P.* H; *Pop. Astronomy* VII, 1)...]

β 1158. Lalande 718

R.A. = $24^h 58^m$
Decl. = $40^\circ 45'$

B and C

1892.91	138.1	6.26	8.6...	8.6	39	β
1898.76	149.7	8.43	8.3	8.3	16	β

A and B: H (181)

1890.91	86.6	79.31	6.9...	39	β
1898.71	86.5	78.86	7.0...	29	β

The wide pair constitutes the double star H 1981. The duplicity of the companion was detected with the 36-inch. H gave the angle 84.8 , and the estimated distance $60''$, with magnitudes 8 and 9. The magnitude of the smaller star in S.D. is 8.6. The magnitudes assigned to A cover a wide

range. LALANDE and SCHWELLBACH, 7; COHENBA, $7\frac{1}{2}$; SCHÖNFELD, 7.2; HEIS, 6-7.

[1818011] 3 (*Mon. Not. Astr. Soc.* 3 (111) 5 (*Pub. L. P.* H; *Pop. Astronomy* VII, 1)...]

β 1226. D.M. (57) 97

R.A. = $24^h 58^m$
Decl. = $40^\circ 45'$

1891.58 190.8 6.40 8.5...10.5 39 β

Discovered with the 36-inch.

[1818011] 3 (*Mon. Not. Astr. Soc.* 3 (111) 5 (*Pub. L. P.* H; *Pop. Astronomy* VII, 1)...]

β 1227. D.M. (57) 98

R.A. = $24^h 58^m$
Decl. = $40^\circ 45'$

A and B

1891.59	206.1	2.82	7.3...	11.6	39	β
1897.04	202.9	2.67	7.3...	11.5	39	β

A and C

1897.05	87.2	22.27	11.0	29	β
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A and D

1897.05	116.6	32.69	...12	29	β
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Discovered with the 36-inch. The distant stars added by AITKEN.

[1818011] 3 (*Mon. Not. Astr. Soc.* 3 (111) 5 (*Pub. L. P.* H; *Pop. Astronomy* VII, 1)...]

β 780. D.M. (10) 114

R.A. = $24^h 58^m$
Decl. = $40^\circ 45'$

1881.93	144.2	2.32	8.8	15	β
1886.82	144.1	2.47	...	15	β
1888.82	144.0	2.40	...	15	β

Discovered with the 36-inch at the Washington Observatory.

[1818011] 3 (*Mon. Not. Astr. Soc.* 3 (111) 5 (*Pub. L. P.* H; *Pop. Astronomy* VII, 1)...]

β 108. O. Arg. N. 432

R.A. $22^{\text{h}} 34^{\text{m}} 1^{\text{s}}$
Decl. $+32^{\circ} 24' 3''$

1874.53	1881.1	4.20	7.0	10.7	6.2	J	
1877.70	1883.3	6.17	8.2	10.5	5.0	O Σ	
1885.60	357.8	4.40			2.0	11 Σ	
1888.88	358.0	6.47				3.0	I
1898.69	358.1	4.30	7.0	10.5	1.0	β	

Discovered with the 6-inch. No evidence of change. The 40-inch shows four faint stars. The single settings are:

357.8	20.87	15.10
252.6	24.06	13.10
188.8	27.25	14.08
202.9	31.75	19.10

[β (III)... β (Mon. Not. XXXIV, 59)... β (I)...O Σ (Poulkova 1882, 3.11, 3.22 and 1891)...10 Σ ()...]

 β 400. 18 (15)

R.A. $12^{\text{h}} 47^{\text{m}} 4^{\text{s}}$
Decl. $+14^{\circ} 3'$

1879.77	3.3	1.2	6	11.2-13	1.0	β
1887.81	62.8	18.0	13	1.0		11
1891.61	3.0	1.2	5.5	1.2	3.0	β
1898.56	57.8	11.2	13.2	2.0		β

The faint companion was noted with the 18 $\frac{1}{2}$ -inch. The principal star has a proper motion of 0.397 in the direction of 93.0 (AUWERS). This movement fully accounts for the change in the position of the companion as shown by the measures. The minimum distance of 18" will be reached about 1962. My first distance in 1877 was erroneously printed 37.12.

In 1887 Ho thought that the principal star was a very close pair, $93.4:0.3 \pm$ (1887.81) 1 μ . In 1890 and 1891 I could not see any elongation with the 36-inch, and it does not appear to have been measured or seen since the time first referred to. It should be watched, but the probabilities are that it is not really double.

[β (Mon. Not. XXXIV, 59)... β (I)...O Σ (Poulkova 1882, 3.11, 3.22 and 1891)...10 Σ ()...]

 β 1096. O. Arg. N. 531

R.A. $22^{\text{h}} 29^{\text{m}} 46^{\text{s}}$
Decl. $+37^{\circ} 54' 3''$

A and B

1889.61	267.7	0.22	9.5	9.5	3.0	β
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B and C

1889.60	61.8	33.58	...	8.0	3.0	β
1898.77	61.7	33.93	...	8.3	2.0	β

Discovered with the 36-inch. The close pair is a difficult object.

[β (XVI)... β (2956)... β (Pub. L. O. II)...]

 β 1097. Radcliffe 151

R.A. $0^{\text{h}} 30^{\text{m}} 30^{\text{s}}$
Decl. $+57^{\circ} 21' 3''$

1889.60	251.6	0.76	8.4	...	8.4	4 μ	β
1891.56	251.7	0.48	8.1	...	8.2	3 μ	β
1897.03	241.1	0.48	8+	...	8+	1 μ	A
1898.00	252.4	0.60	...	...	...	2 μ	Hu

Discovered with the 36-inch. The magnitude in the Radcliffe Catalogue is 7.4, and in D.M. 7.0. So far there is no evidence of change.

[β (XVI)... β (2956)... β (Pub. L. O. II)...Arkon (3465)...Hussey ()...]

 β 230. W² 6764

R.A. $6^{\text{h}} 39^{\text{m}} 59^{\text{s}}$
Decl. $+26^{\circ} 39' 3''$

1891.75	324.1	3.91	8.4	...	9.6	3 μ	β
1897.09	323.7	3.55	8.5	...	9.6	1 μ	β

Discovered with the 6-inch. Unchanged.

[β (Mon. Not. XXXIV, 59)... β (I)... β (Pub. L. O. II)...]

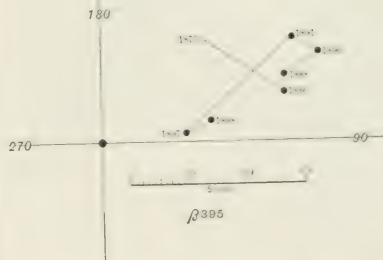
β 395. *Cell 82.* B.A.C. 100

R.A. $6^h 31^m 12^s$
 Decl. $-25^{\circ} 29'$

1875.84	135	2.5	6.0...	6.0	1 st	β
1886.85	104.7	0.65	6.1...	6.3	2 nd	LM
1888.01	159.4	...	7	7	1 st	Pol
1888.89	109.6	0.67	6.0...	6.4	3 rd	Lv
1889.99	111.4	0.88	6.0...	6.0	2 nd	III
1890.82	112.0	0.74	6.0...	6.1	3 rd	β
1891.83	113.2	0.69	...	...	1 st	Lv
1891.85	118.2	0.75	6.9...	7.2	3 rd	β
1897.65	278.2	0.22	...	...	2 nd	See
1897.67	272.8	0.25	...	...	1 st	C2
1897.82	253.9	0.31	...	...	1 st	β
1897.92	273.7	0.27	...	...	3 rd	A
1897.92	275.1	0.31	...	...	3 rd	Hu
1898.59	280.4	0.38	6.2...	6.3	3 rd	A
1898.69	277.5	0.68	7.5...	7.5	1 st	β

This interesting system was discovered with the 6-inch, and it was evident from the first that it was a physical pair from the large proper motion of the components, since if this movement belonged to one of the stars only, a few years preceding its discovery it would have been a wide and easy pair, and hence catalogued as a double star.

SEE, using the measures to 1897.67, has computed the orbit, and found a period of 16.3 years (A.N. 3455). This assumes a change in position-angle of about 180° between 1891 and 1897. From the slow motion in angle and distance between the date of discovery and the last measures in 1891, it seems very probable that in all the observations the companion star should be put in the same quadrant. It will be seen from the magnitude estimates when the distance was the greatest that the components are very nearly equal, and a correction of 180° may be considered as allowable in any of the measures. It is not material whether we consider the second or the fourth quadrant as the correct one for the smaller star. There is no question of the binary character of this pair, but if the change has been in a gradual approach of the two components, as seems most likely, the period will not be a short one. The measures of the next few years will show whether or not there has been any rapid angular motion. The principal measures are shown on the accompanying diagram.



Some of the values for the proper motion are:

Stumpfe	1.402 in 91.3
Kustner	1.379 in 90.6
Porter	1.524 in 90.2
Bassett	1.429 in 90.2

[β (VII) 3 0213, 3048, 1003 3 2700 1 10000
 (Pub. Sydney Obs., 1891) (Mem. R. A. S. L.)...Lv?...Lv
 (Sid. Mess. VIII, 77) (Proc. Haverford Coll. Obs., 1891)...
 Hall (10)...See (A. J. 412)...See (3455, 3495)...Aitken
 (A. J. 424, 429)...Hussey (A. J. 427)...]

 β 1159. D.M. 1.6, 1.147

R.A. $12^h 28^m$
 Decl. $+4^{\circ} 41'$

1890.68	41.7	2.21	9.7	9.8	3 rd	β
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This very minute and difficult pair, discovered with the 36-inch, is involved in the extreme preceding end of the great nebula in *Andromeda*. The magnitude in D.M. is 8.9.

[β (XIII) 3 0037 30037 30037 30037]

 β 401. δ *Andromedae*

R.A. $12^h 28^m$
 Decl. $+4^{\circ} 41'$

1878.40	299.3	27.86	5	5	3 rd	β
1888.71	299.7	27.60	5	5	3 rd	β
1890.26	299.4	27.58	5	5	3 rd	β
1898.25	299.5	27.55	5	5	3 rd	β

Discovered with the 26-inch of the Naval Observatory. The position angle in 1898 was 180° .

in 1878 as α^2 in the direction of 120°. It is evident from the measures that this movement is common to both stars. Assuming the measured distance of 1878 as correct, the distance of the companion, if fixed in space, should have been 30'.9 at the date of my last measures in 1898. It is certain, therefore, that these stars form a physical system, although apparently relatively fixed for the last twenty years.

[β (v)... β (*Mon. Not.* XXXV, 31)... β (*Pub. L. O. II*)... β (*Hussey* ()...)]

β 257. Lalande 1816

R.A. = 4h 27m
Decl. = 17° 38' N

1876.34	190.1	0.48	7.0...	9.0	1m	J
1891.68	237.1	0.85	5.4	5.8	3m	β
1898.00	244.3	0.60			2m	Hu

Discovered with the 9.4-inch of the Dartmouth College Observatory. Change in angle is probable.

[β (v)... β (*Mon. Not.* XXXV, 31)... β (*O. II*)... β (*Pub. L. O. II*)... β (*Hussey* ()...)]

β 100. 659 (1)

R.A. = 13h 43m
Decl. = 17° 38' N

1876.34	190.1	0.48	7.0...	9.0	1m	Ch
1876.73	164.0	11.02	10.7...	11.2	3m	J
1893.82	160.3	11.61	10.0...	11.0	1m	W
1898.69	160.1	7.8	6.2	6.6	1m	β
1898.79	160.5	11.24	10.2	10.6	2m	C

β 606.5

1876.34	355.7	91.11	7.0...		1m	J
1893.82	356.6	91.2	7.0...		1m	W
1898.69	100.4	100.0	7.0...		1m	β
1898.67	102.5	92.21	6.7...		1m	C

β 866 II

1898.79	354.8	100.0	6.8...		4m	C
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Unimportant wide double companion; noted with the 6-inch. Lalande 1064.

[β (v)... β (*Mon. Not.* XXXV, 31)... β (*O. II*)... β (*Pub. L. O. II*)... β (*Hussey* ()...)]

β 231. o Cassiopeia

R.A. = 0h 38m 27s
Decl. = 17° 38' N

1876.31	305.9	32.81	5.5...	12	1m	J
1878.17	303.7	32.16			1m	β
1888.71	303.5	32.03	...	11.6	3m	β
1898.00	303.1	32.00			2m	Hu

Discovered with the 6-inch. ALWERS gives as the proper motion of the principal star o'018 in the direction of 145°.9. The movement is too small to say with certainty whether the two are moving together.

[β (v)... β (*Mon. Not.* XXXV, 31)... β (2875)... β (*Pub. L. O. II*)... β (*Hussey* ()...)]

β 492. B.A.C. 201

R.A. = 0h 38m 27s
Decl. = 17° 38' N

1878.73	152.6	1.90	6...	12	2m	β
1885.69	150.70	2.23			2m	IIΣ
1889.55	152.7	2.11	5.7...	11.3	3m	β
1898.68	151.5	2.12	6.0...	12.0	2m	β

Discovered with the 26-inch at the Naval Observatory. ROGERS gives the proper motion of this star as o'066 in the direction of 317°.3. The measures show relative fixity, and they are, therefore, moving together. A naked-eye star in *Cassiopeia*.

[β (X)... β (2956)... β (*Pub. L. O. II*)...IIΣ...]

β 865. D.M. 11° 150

R.A. = 0h 38m 32s
Decl. = 17° 35' N

1880.78	197.4	1.21	8.5...	9.5	1m	β
1891.83	197.4	1.35	8.3...	8.8	3m	β
1898.50	195.5	1.35			2m	Hu
1898.65	192.0	1.48			1m	Row

Discovered with the 18½-inch. Without change. β 866 is closely following.

[β (v)... β (1141)... β (*Pub. L. O. II*)... β (*Hussey* ()...)]

β 493. D.M. (50) 137

R.A. $6^h 39^m 4^s$
Decl. $+86^\circ 27'$

1878.67	51.4	0.85	9.0...	9.0	2H	β
1891.85	51.4	0.77	9.0...	9.1	2H	β
1891.92	55.6	0.5	...	...	1H	Sp
1898.76	54.7	0.69	9.0...	9.2	1H	β

Discovered with the 18 $\frac{1}{2}$ -inch. The ρ of a small triangle of 9 m stars. There seems to be no sensible change. There is a 3 $^{\text{rd}}$ pair of stars 89" distant in the direction of 216.8.

[β (X)... β^{a} ... β (1113)... β (Pub. L. O. II)...Sp (III)...]

 β 860. D.M. (121) 196

R.A. $6^h 39^m 43^s$
Decl. $+82^\circ 45'$

1880.78	68.2	1.26	0.2...	9.2	4H	β
1891.83	69.6	1.30	0.2...	9.1	3H	β

Discovered with the 18 $\frac{1}{2}$ -inch. Without change. β 865 is in the field ρ .

[β (XII)... β^{a} ... β (1113)... β (Pub. L. O. II)...]

 β 494. Lalande 1269

R.A. $6^h 40^m 53^s$
Decl. $+1^\circ 54'$

1878.20	168.5	1.38	8.1	8.1	2H	β
1886.82	171.2	1.36	8.1	8.1	3H	L.M.
1888.76	170.5	1.27	8.3	8.4	4H	L.V.
1888.87	171.4	1.34	8.0	8.0	4H	I
1892.86	171.8	1.37	8.2	8.2	1H	G.I.
1896.91	173.1	1.29	...	...	1H	Cod.
1898.65	172.0	1.33	8.2	8.3	3H	Bd.
1898.93	180.5	1.62	...	...	1H	Sol.

Discovered with the 18 $\frac{1}{2}$ -inch. Apparently fixed.

[β (X)... β^{a} ...Lv...L.M...Tarrant (2991)...Glaserapp (II)...Boothroyd (...).Coleman (*Mem. R. A. S.* 131)...Sola (3553)...]

 β 495. Lalande 1338

R.A. $6^h 42^m 25^s$
Decl. $+18^\circ 2'$

1878.70	235.9	0.38	7.5	7.5	1H	β
1883.80	223.8	0.5	...	...	2H	Eng ¹
1885.14	225.8	0.60	7.8...	7.6	5H	En
1885.87	224.1	0.60	...	...	2H	14 Σ
1887.98	225.0	0.54	6 ...	7	2H	14 Σ
1889.92	225.5	0.63	...	...	5H	Sp
1891.66	224.9	0.65	7.8	7.7	3H	β
1896.80	222.2	0.57	...	...	1H	Bow
1896.95	221.3	0.81	...	...	1H	I
1897.83	218.8	0.68	...	...	1H	Bow
1897.87	219.7	0.62	...	...	2H	I
1898.76	222.5	0.77	8.0...	8.2	1H	β
1898.82	220.3	0.85	...	...	3H	Bow

Discovered with the 18 $\frac{1}{2}$ -inch. The motion, if any, is very slow. The measures by HALL are erroneously credited to OS 20.

[β (X)... β^{a} ... β (3113)... β (Pub. L. O. II)...J. J. M. Perry (*Eng. Mechanic* XXXVIII, 192; XXXIX, 11)...Engelmann (2786)...H2 (...).Hall (II)...Lewis and Bowyer (*Mon. Not. LIX*, 400)...]

 β 301. Lalande 135

R.A. $6^h 43^m 21^s$
Decl. $+22^\circ 5'$

A and B

1891.74	318.8	0.00	8.3	7.4	3H	β
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A and C

1875.92	299.8	5.5	9.0	9.0	3H	C.I.
1891.78	300.7	10.23	8.3	9.4	3H	β
1893.92	298.9	10.5	9	1.0	1H	Sol.
1898.92	300.0	11.02	8.5	8.8	1H	β

It was discovered with the 6-inch, and the same star that with the 30-inch the first star was detected. It is difficult with the large instrument.

[β (VI)... β (2662,3113)... β (Pub. L. O. II)...Cm...Sellers (2747)...]

β 1100. D.A.C. 23

R.A. α 48^m 42^s
Decl. δ 41 45 S

1875.71 1883.97 1891.64 1.4 2.3 4.2 5.12 5.04 5.31 7.5 12.5 20 β

Discovered with the 36-inch. This is a naked-eye star in *Cetus*. The magnitude in Gould is 5.9. [β (XVII)... β (3047)... β (*Pub. L. O. II*)...]

 β 232. O. Arg. N. 794

R.A. α 45^m 28^s
Decl. δ 43 50 S

A and B

1875.71	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

AB and C

1875.99	292.8	28.70	1.02	30	Δ
1891.66	293.8	28.40	0.1	30	β
1897.77	294.3	28.42		20	T
1898.65	293.6	28.01		20	β

Discovered with the 6-inch. It is certain that the close pair is in moderately rapid motion. At the time of the discovery of this pair, in October, 1874, the angle of AB was estimated 20°, "nearly in the direction of C," thus confirming the position found by J in 1876.

[β (XV)... β (3047)... β (*Pub. L. O. II*)...]
[β (XV)... β (3047)... β (*Pub. L. O. II*)...]
[β (XV)... β (3047)... β (*Pub. L. O. II*)...]

 β 781. Lalande 1337

R.A. α 48^m 42^s
Decl. δ 41 45 S

1875.71	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

Discovered with the 15½-inch at the Washburn Observatory. So far there has been no change.

[β (XV)... β (3047)... β (*Pub. L. O. II*)...]
[β (XV)... β (3047)... β (*Pub. L. O. II*)...]
[β (XV)... β (3047)... β (*Pub. L. O. II*)...]

 β 496. Lalande 1116

R.A. α 48^m 42^s
Decl. δ 41 45 S

1875.71	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

Discovered with the 18½-inch. No sensible change.

[β (X)... β (3113)... β (*Pub. L. O. II*)...] $\Pi\Sigma$ ()...]

 β 1. O. Arg. N. 819

R.A. α 48^m 42^s
Decl. δ 41 45 S

A and B

1875.34	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

A and C

1875.34	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

A and D

1875.34	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

A and E

1875.34	1883.97	1891.64	1.4	2.3	4.2	5.12	5.04	5.31	7.5	12.5	20	β
1883.82	291.0	0.4	8.0...	8.3	00	J						
1891.66	320.1	0.41	8.0.	8.4	30	β						
1892.84	319.7	0.02			00	Bar						
1892.99	321.2	0.4			00	Sp						
1896.09	323.1	0.4			30	Sp						
1897.77	320.1	0.38			20	T						
1898.65	320.7	0.31	8.0.	8.0	20	β						

[illegible]

β 255. *Leptocarpus* sp.

Date		Time		Location		Remarks	
Year	Month	Day	Hour	Lat	Long	Alt	Wind
1985	10	10	06.2	49° 2'	118° 2'	2	SE
1985	10	10	08.0	49° 2'	118° 2'	3	SE
1985	10	20	08.0	49° 2'	118° 2'	11	SE
1985	10	20	08.8	49° 2'	118° 2'	11	SE
1985	10	20	09.0	49° 2'	118° 2'	3	SE
1985	10	20	09.5	49° 2'	118° 2'	3	SE

Discovered with the 6-inch. Change is uncertain. AITKEN speaks of a 12m star, $204^{\circ} : 41''$.

$$L(0, m) \dots J(2086) \dots J(1), \dots H\Sigma(\dots) \dots Sp(m) \dots$$

β 1100. 1940. 2188

	ΔA	$10^{-2} \sigma_{\text{rel}}$	σ_{rel}	σ_{rel}	σ_{rel}	σ_{rel}
	$\text{mmol}^{-1} \text{cm}^{-1}$	$\%$	$\%$	$\%$	$\%$	$\%$
CHCl ₃ (1)	11.1	2.8	7.4	7.4	39	B
CHCl ₃ (2)	11.1	7.5			35	A
CHCl ₃ (3)	11.1	4.9	7.5	7.5	39	B

Discovered with the 36-inch. The measures indicate some motion.

$$\lim_{\substack{t \rightarrow \infty \\ \omega(t) \rightarrow 0}} \frac{\omega(t)}{t} = 0 \quad \text{if and only if} \quad \lim_{t \rightarrow \infty} \frac{1}{t} \int_0^t \omega(s) ds = 0. \quad \text{Apkari, 14/1}$$

β 1029. ζ / 10.11.11

Table 1		Table 2	
Year	Age	Year	Age
1885, 71	0.93	11	50
1885, 69	0.7 ±		30
	248.5	1885	30
1895, 60	249.1		10
			30
	211.7		0.97
			0.88

λ	μ	ν	α	β	γ	δ	ϵ	ζ
1.000000	0.000000	0.000000	0.00	5.3	0.0	0.0	0.0	0.0
0.999999	0.000001	0.000000	4.2...	0.0	0.0	0.0	0.0	0.0
0.999998	0.000002	0.000000			0.0	0.0	0.0	0.0
1.899992	0.000008	0.000000			0.0	0.0	0.0	0.0
1.899976	0.000024	0.000000			0.0	0.0	0.0	0.0

The close pair was discovered with the 30-inch ALWINKS gives the proper motion of A as $\alpha' 1.23$ in the direction of $114^{\circ} 6$, and this is obviously the movement of B, as these stars have remained relatively fixed since the first measures were made. The measures of C cover a sufficient time to show that the small star belongs to the system. The position of this star for 1898.7, with reference to B, if fixed, should be $268^{\circ} 3 : 1^{\circ} 99$ from the proper motion of the large star. It is evident from the measures that no such change has taken place, and that there is probably slow orbital motion. These three stars undoubtedly constitute a vast physical system. It would appear from the measures of the last seventy years that the proper motion of B is identical with that assigned to A from the meridian observations. From the position of B given by Σ in 1832, assuming that star to be fixed in space, its relation to A in its position in 1898.8 would be

$114^{\circ} 7 : 1^{\circ} 14$

[β (xiv)... β (2875, 3048)... β (*Pub. L. O. II*)...Sp (III)...
D...*Mex. A. Z.* 131, 153...*CHENNAI*...1895)
Aitken (3395)...]

The measures of the wide pair ($\approx 2100 = H^+$, $14.8 = Sh\ 16$) are very numerous, and cover, first and last, more than a century. The early distances, however, are inaccurate and inconsistent, and the reliable results commence with the measures of Σ . A few only of the measures are given above, but sufficient to show the relative fixity of these stars. All the measures will be found in the following:

Madler (*Dorpat Obs.*, IX, x, XIII, XV) (*Fixtures Sym.* I), .
Herschel (*Mém. R. A. S.* XXXVIII), . Dawes (*Amer. R. A. S.*
Bull. 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869,
Kaiser (409), . Peters (1042), . Auwers (1393), . Bessel (Rechen-
35 *33 Doppelsterne*). Koiser (*Annalen der Sternwarte VII*, (Leib-
den, 1872), . Flecher (*Mém. R. A. S.* XXII), . Wichman
(*Ergänzung-Hft. Astron. Nachr.* 1849), . Secchi (*Catalogo dis-*
1321 *Sole di Doppie*), . Luther (*Königsberg Beob.* I, II, III),
Olm at Barclay's Observatory), . Engelmann (*Mess. von neuigen*
Doppelsternen, 1865), . Gieslheim (*Mess. von R. A. S.* XLII), .
Wagner, mit Seidenstein (*Mess. R. A. S.* XVII, XVIII), *Annal.*
Harvard Obs., XIII, . Oz (*Poukowna Obs.*, IX), . Dunst
(*Measures Microm.* Lund, 1876), . Perrotin (*Annals Obse.*
d' Nice I), . Engelhardt (*Obs.* Astron. II), . Giacomelli (*Accad.*
di Lincei, 1880, VI), . Jedrejzewski (2324), . Sp (II), (I)
(1118), . Oz (I, II), . Franz (2509), . Glasenapp (II, III), .
Cohn (3240), . Haagen (3258), . Chofardet (3450), . Coleman
1867, I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII,

β 3. D.M. 355 277R.A. 1 11 30.0
Decl. - 55 52.5

1875.48	28.0	4.37	7.8...	10.2	4 ^m	J
1888.68	29.4	4.18	7.7	10.3	2 ^m	T
1893.01	29.5	4.58	7.7	10.3	3 ^m	W

Discovered with the 6-inch. Without motion.

[*St. Alb. 3 (M. N. 1881, 1881)* ... *Townsend* ...
Wilson () ...] **β 503.** Lalande 2317R.A. 1 11 30.0
Decl. - 55 52.5

1878.38	136.7	5.44	8.0...	12.0	3 ^m	β
1885.93	136.8	5.83	...	...	1 ^m	H Σ
1898.65	134.0	5.77	8.0...	11.5	2 ^m	β

Discovered with the 18½-inch. Apparently fixed.

[β (x)... β^* ...H Σ () ...] **β 504.** Lalande 2318R.A. 1 11 30.0
Decl. - 55 52.5

1878.35	277.3	1.42	7.7	11.7	3 ^m	β
1897.93	279.3	1.87	...	...	3 ^m	Bz

Discovered with the 18½-inch.

[β (x)... β^* ...Brown () ...] **β 782.** Lalande 2317R.A. 1 11 30.0
Decl. - 55 52.5

1881.57	79.2	2.05	8.0...	8.6	3 ^m	β
1885.70	77.5	2.06	...	...	2 ^m	H Σ
1886.86	76.2	2.82	...	...	2 ^m	U I
1888.41	76.7	3.16	8.0...	8.4	3 ^m	Com
1893.20	80.9	2.06	8.1...	8.6	4 ^m	W

Discovered with the 15½-inch at the Washburn Observatory. Apparently without change.

[*St. Alb. 3 (M. N. 1881, 1881)* ... *Townsend* ...
burn Obs. v, vi) ... Wilson () ... H Σ () ...] **β 1229.** Cord. G.C. 1244R.A. 1 11 30.0
Decl. - 55 52.5

1891.84	292.4	1.04	8.1...	8.4	3 ^m	β
1893.91	292.9	1.02	8.5...	8.5	2 ^m	Sel
1896.82	291.3	0.96	...	...	1 ^m	See
1896.84	291.6	1.12	...	...	2 ^m	Cg
1897.96	292.6	1.14	...	...	3 ^m	A

Discovered with the 12-inch. So far there has been no change.

[β (xviii)... β (3113)... β (Pub. L. O. ii)... Sellors (3240)...
See and Cogshall (3495)... Aitken (*A. J.* 429)...] **β 4.** *Procyon* 255R.A. 1 11 30.0
Decl. - 55 52.5

1872.81	132.2	0.5	8	...	8.5	β
1876.76	...	Single	7	...	...	O Σ
1877.17	81.0	...	7.0...	7.5	1 ^m	β
1879.66	116.1	...	7.0...	7.0	1 ^m	Cin
1880.84	75.9	0.58	7.5...	8	3 ^m	β
1886.73	73.6	0.48	6.6...	8.3	3 ^m	I M
1888.84	...	0.43	7.1...	7.1	3 ^m	Lv
1889.93	69.1	...	...	...	3 ^m	Sp
1890.88	69.2	0.40	7.8...	8.8	4 ^m	β
1898.73	67.4	0.36	7.0...	7.5	2 ^m	β

AB and C

1898.76	248.9	22.28	...	13.5	1 ^m	β
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Discovered with the 6-inch. Slow retrograde motion is probable, with no sensible change in distance. In 1875 J could only see a doubtful elongation in 68°. This star is LALANDE 2435. The faint star first noted with the 36-inch.

[*St. Alb. 3 (M. N. 1881, 1881)* ... *Townsend* ...
(*Pub. L. O. ii*) ... Cin ... O Σ (*Dalbous Obs.* X) ... LM ...
Lv ... Lv (*Sid. Men.* VIII, 77) ...] **β 1101.** *ψ* 1101R.A. 1 11 30.0
Decl. - 55 52.5

A and B

1889.52	41.2	3.3	4.5	...	4 ^m	β
1891.52	44.0	2.93	...	...	4 ^m	β
1898.88	41.8	2.83	...	...	3 ^m	β

A and C

1881.84	110.3	134.26	...	2 ⁿ	β
1888.75	110.3	132.49	...	3 ⁿ	β
1891.97	110.3	130.93	...	1 ⁿ	β
1897.82	110.4	128.84	...	2 ⁿ	β

C and D (= β 82)

1881.84	140.1	5.04	10.7...10.7	3 ⁿ	β
1888.75	137.9	4.96	10.2...10.2	3 ⁿ	β
1892.03	139.0	4.53	10.5...10.5	2 ⁿ	β
1897.82	138.3	5.07	...	2 ⁿ	β
1898.87	136.8	5.32	10.5...10.5	1 ⁿ	L

The distant double companion was noted with the 6-inch in 1872, and the close companion to the bright star with the 12-inch at Mt. Hamilton in 1881. The principal star has a considerable proper motion:

Bonn	-	-	0.347 in 187.1
Bossert	-	-	0.355 in 106.3

The measures of 1881 and 1897 give an annual movement of 0".339 in the direction of 110° 3'. It is obvious from the observations of AB that the small star is moving in space with the other, and that they form a physical system, with probably slow direct angular motion. The distant stars, CD, are apparently unchanged relatively.

[β (II, XII)... β (I, *Mon. Not. XXIII*, 1373)... β (2875, 3114)... β (A, & A-P, XIII, 15)... β (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX*, 400)...]

 β 1164. 05 *Ursæ*

R.A.	1 ^h 21 ^m 26 ^s
Decl.	+ 4° 41'

1890.82	168.4	0.30	0.7...7.0	3 ⁿ	β
1892.97	167.4	0.33	...	4 ⁿ	Sp
1895.49	162.4	0.43	...	2 ⁿ	L
1896.53	171.0	0.32	...	2 ⁿ	Sp
1898.73	163.0	0.36	6.5...7.2	1 ⁿ	β
1898.94	160.2	0.40	7.0...7.5	1 ⁿ	A

Discovered with the 36-inch. In B.A.C. 7 m; in D.M., 8.0; and Boss, 7.3. The principal star has some proper motion:

Boss	-	-	0.102 in 149.3
Porter	-	-	0.153 in 202.7

These stars certainly make a binary system, as they are evidently moving in space together. So far there is but little relative change. Assuming as correct the relation shown in the first set of measures, the distance should be 0".94 and the angle 36° in 1898 if the proper motion belonged to only one star.

[β (XVIII)... β (3047)... β (*Pub. L. O. II*)...Lewis (*Mon. Not. LXI*, 359) (*Greenwich Obs.*, 1895)...Sp (III)...Aitken (I)...]

 β 399. *Cæ* 211

R.A.	1 ^h 21 ^m 48 ^s
Decl.	+ 11° 31'

1876.90	302.3	1.56	6.3...10.0	3 ⁿ	J
1886.61	301.6	1.66	5.8...8.4	4 ⁿ	LM
1893.81	307.0	1.78	6.2...9.5	2 ⁿ	W
1898.05	301.7	1.66	6.4...9.2	3 ⁿ	Bd
1898.72	305.4	1.84	6.0...9.0	2 ⁿ	β

Discovered with the 6-inch. A naked-eye star; The change, if any, is slight. HEIS, 6-7 m. L 2675.

[β (VII)... β (2103)...A (I)...LM...Wilson (I)...Boothroyd (I)...]

 β 1230. *Lacæ* 127

R.A.	1 ^h 21 ^m 43 ^s
Decl.	+ 29° 33'

1891.84	224.5	2.02	7.0...12.5	2 ⁿ	β
1898.09	225.9	2.07	6.7...12.2	3 ⁿ	C β
1898.82	221.2	2.91	6.2...11.5	2 ⁿ	β

Discovered with the 12-inch. In G.O.D. 0.2 m

[β (XVI)... β (3113)... β (3106)... β (3107)... β (3108)...]

 β 1165. *W.L.* 510

R.A.	1 ^h 28 ^m 4 ^s
Decl.	+ 40° 27'

1890.83	62.4	1.82	8.4...12.4	4 ⁿ	β
1898.71	60.5	1.86	8.2...10.5	1 ⁿ	β

Discovered with the 12-inch.

[β (XVII)... β (3047)... β (*Pub. L. O. II*)...]

β 506. η Piscid.

R.A. $25^{\text{h}} 40^{\text{m}}$
Decl. $+34^{\circ} 41'$

1879.91	14.2	1.16	10.7	3 μ	β
1880.00	16.5	1.10	10.0	3 μ	β
1880.10	14.8	1.10	10.0	3 μ	β
1895.88	25.0	0.63	10.5	1 μ	L
1896.00	14.1	1.10	10.0	1 μ	L

Discovered with the 18 $\frac{1}{2}$ -inch. Down to this time there is no evidence of relative motion. The proper motion of the principal star is very small. The value, according to AUWERS, is 0.0035 in the direction of 124.6. The time covered by the measures is too short to show whether or not this movement belongs to the small star. It will probably turn out to be a physical pair.

[β (XIII) β ... β (2875.3048)... β (*Pub. L. O. II*...
Ann. Obs. Paris, 1896, p. 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000]

 β 507. D.M. 8.6

R.A. $25^{\text{h}} 40^{\text{m}}$
Decl. $+34^{\circ} 41'$

1879.91	13.8	2.00	7.8	10.6	3 μ	β
1880.00	13.0	2.01	8.0	11.0	3 μ	β
1895.87	156.9	2.16	1.1	1.1	1 μ	L
1896.00	153.5	2.20	1.1	1.1	1 μ	Bry
1897.97	158.6	1.11	1.1	1.1	1 μ	L
1897.97	1.11	2.24	1.1	1.1	1 μ	L
1897.87	1.11	1.11	1.1	1.1	1 μ	L

Discovered with the 18 $\frac{1}{2}$ -inch. The magnitude in D.M. is 8.6. No change is shown by the measures.

[β (XIII) β ... β (2875.3048)... β (*Pub. L. O. II*...
Ann. Obs. Paris, 1896, p. 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000]

 β 1000. O. Arg. S. 935

R.A. $25^{\text{h}} 40^{\text{m}}$
Decl. $+34^{\circ} 41'$

1891.54	7.6	1.10	10.7	3 μ	β
1891.60	8.0	1.10	10.0	3 μ	β
1891.70	7.0	1.10	10.0	3 μ	β

Discovered with the 12 inch at Mt. Hamilton in 1881. The companion is in rapid motion, but the character of the movement is uncertain at this time. It is probably a binary, as the change does not at all correspond to what appears to be the proper motion of A, as shown by the measures of an 8 $\frac{1}{2}$ in star, η f, O. Arg. S. 938:

A and O. Arg. S. 938

1850	19.1	140.51	O. Arg. S.
1875	20.9	142.41	Cord. G.C.
1891.85	20.5	142.09	3 μ β
1898.69	20.7	141.61	2 μ β

The first two positions are derived from meridian observations. A comparison of O. Arg. S. with the mean place from the micrometrical measures, assuming that the change is due to the movement of A, gives the proper motion of that star, 0.132 in the direction of 340.9. The smaller star may have some proper motion of its own. The measures of AB in the next few years will show whether or not the motion is rectilinear. The 40-inch shows a 14 in star, 329.5: 28.0.

[β (XIII) β ... β (2875.3048)... β (*Pub. L. O. II*...
Ann. Obs. Paris, 1896, p. 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263,

A and C

1898.70 8.9 24.82 ... 13.5 2^m β

Discovered with the 12-inch.

[β (xvii)... β (3047)... β (*Pub. L. O. II*)...Hussey ()...] β 508. D.M. 126. 276R.A. 1 32 27
Decl. +26 261877.72 71.1 1.02 9.0... 0.5 1^m β
1890.47 63.1 0.6 ... 6^m Sp
1898.82 64.6 0.68 ... 3^m HuDiscovered with the 18 $\frac{1}{2}$ -inch.[β (x)... β ...Sp (iii)...Hussey ()...] β 783. O. Arg. N. 1777R.A. 1 32 13
Decl. +73 591881.71 318.0 0.95 8.5... 8.9 4^m β
1888.82 315.5 0.96 9.0... 9.9 3^m ComDiscovered with the 15 $\frac{1}{2}$ -inch.[β (xiii)... β ...Comstock (*Pub. W. 1890 O. 331*) β 5. 1st 3 *Piscium*R.A. 1 32 17
Decl. +10 11875.52 289.4 1.31 7.0... 9.0 1st J
1876.76 287.7 1.40 7.0... 9.5 1st O Σ
1880.78 297.5 1.31 6.9... 9.3 3rd β
1883.85 292.5 1.4 ... 1st Per
1887.92 294.3 1.26 7.0... 9.2 2nd I
1888.68 293.1 1.31 7.0... 9.0 2nd I
1889.01 292.8 1.15 6.9... 9.2 2nd Ix
1889.95 292.0 1.07 ... 3rd Sp
1898.00 290.7 1.35 ... 3rd Br

Discovered with the 6-inch. No relative change is shown by the measures. The principal star has a proper motion of 0'.040 in the direction of 228.3 (AUWERS). If the small star was fixed, its position at the date of the last measures in 1898

would be 330.4:1'.20. It is therefore certain that the two stars are moving together, and that they form a physical system.

[β (i)... β ...A (i)...Ly...J.J. M. Perry (*Eng. Mech.* XXXIX, 11)...Tarrant (2899,2991)...O Σ (*Poulkova Obs.* X)...Sp (iii)...Brown ()...] β 1167. W. 1, 716R.A. 1 35 19
Decl. +38 71890.82 56.2 1.25 9.3... 10.7 3^m β
1898.73 56.2 1.32 ... 3^m Hu

Discovered with the 12-inch. The magnitude in D.M. is 8.8.

[β (xvii)... β (3047)... β (*Pub. L. O. II*)...Hussey ()...] β 1103. 44 *Cassiopeia*R.A. 1 35 13
Decl. +59 571889.54 3.8 1.73 6.2... 12.5 3^m β
1898.61 4.6 1.73 ... 13.0 1st β

Discovered with the 36-inch. KRUEGER gives the proper motion of the large star as 0".060 in the direction of 103.1. If the companion was fixed in space, its position with reference to A at the date of the last measures would be 347.3:1'.89. The measures show clearly that the two stars are moving together.

[β (xvi)... β (2948)... β (*Obs.* 1891, 1892) β 1104. *Geminorum* 37.1R.A. 1 32 27
Decl. +32 171889.60 107.2 2.80 7.2... 11.5 3^m β
1898.72 104.8 2.97 7.0... 11.7 1st β
1898.73 105.2 3.04 ... 3^m Hu

Discovered with the 12-inch. Apparently unchanged.

[β (xvi)... β (2948)... β (*Obs.* 1891, 1892) Hussey ()...]

β 1168. W. 1757

R.A. 17 57 12.0
Decl. - 18 42.5

1800.1	1800.1	7.00	8.5	2 ^m	β
1800.4	206.2	2.20	8.5	2 ^m	A
1800.4	206.2	2.20	8.5	2 ^m	Bd
100 measured with the 10-inch. It is 2 ^m 42 ^s and 1.4 0.02 1900.					
[Greenwich, 1807]... β (Pub. L. O. 11)...Hussey ()...					
[Dartmouth, 1807]... β (Pub. L. O. 11)...Hussey ()...					

 β 1169. W. 1757 (1757)

R.A. 17 57 12.0
Decl. - 18 42.5

1890.85	206.4	2.20	8.5	12.3	β
1890.91	206.2	2.20	8.5	12.3	β
1890.92	206.2	2.20	8.5	12.3	Hu

Discovered with the 12-inch.

[β (XVII)... β (3047)... β (Pub. L. O. 11)...Hussey ()...]

 β 259. W. 1805

R.A. 18 05 12.0
Decl. - 18 42.5

1877.86	236.8	4.25	8.2	9.7	3 ^m J
1877.86	236.8	4.25	8.2	9.7	3 ^m Cin
1877.86	236.8	4.25	8.2	9.7	3 ^m Lx
1877.86	236.8	4.25	8.2	9.7	3 ^m Lx

Discovered with the 9.4-inch of the Dartmouth College Observatory. Probably without change.

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

 β 260. W. 1805 (1805)

R.A. 18 05 12.0
Decl. - 18 42.5

1877.86	236.8	4.25	8.2	9.7	3 ^m J
1877.86	236.8	4.25	8.2	9.7	3 ^m Cin
1877.86	236.8	4.25	8.2	9.7	3 ^m Lx
1877.86	236.8	4.25	8.2	9.7	3 ^m Lx

Discovered with the 6 inch. The change, if any,

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

 β 512. D.M. 1808 1244

R.A. 18 08 12.0
Decl. - 18 42.5

1878.01	27.3	1.45	9.0	1.3	2 ^m β
1890.58	23.8	1.64	8.6	1.17	3 ^m β
1895.87	202.00	1.25	8.6	1.17	1 ^m L
1897.86	27.2	1.84	8.6	1.17	1 ^m L
1898.88	18.5	1.97	8.0	1.25	1 ^m A
1898.96	23.8	1.54	8.9	1.32	3 ^m β

Discovered with the 18½-inch. This star is a distant companion to γ Arietis. The measures are not sufficient to decide as to relative motion. There seems to be an error in the angle of 1895. The following are all the measures connecting the star with γ Arietis:

γ Arietis (A) and β 512

1823.80	82.0	228.70	1 ^m	Sh
1878.71	84.3	223.82	1 ^m	β
1898.92	83.9	223.23	1 ^m	β

The principal star of γ Arietis has a proper motion of 0.107 in the direction of 152.4 (Arietis), and this substantially accounts for the change.

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

 β 183. Lalande 1487

R.A. 18 08 12.0
Decl. - 18 42.5

1875.92	226.4	8.5	19.5	1 ^m	Cin
1876.03	227.9	2.60	8.4	9.4	1 ^m J
1877.79	226.9		8.0	9.0	1 ^m Cin
1879.77	226.7	2.42	8.0	9.5	1 ^m Cin
1882.76	229.6	2.72	8.5	9.5	1 ^m W
1885.95	227.5	2.40	8	11	1 ^m LM
1893.81	227.6	2.62	8.0	9.8	2 ^m W
1898.85	229.2	2.60	8	8.7	3 ^m Bd

Discovered with the 6-inch. Evidently fixed.

[β (XVI)...J (11)...Cin...Lv...Cogshall ()...]

β 7. ζ 8 Ceti

R.A. 1^h 51^m 43^s
Decl. $-2^{\circ} 39'$

1875.53	12.1	2.86	7.0...12.0	3 ^m	J
1877.78	11.4	2.85	6.7...10.8	3 ^m	Clm
1880.94	12.8	2.73	6.2...11.0	2 ^m	β
1886.91	10.9	3.10	7.0...10.8	4 ^m	L.M
1888.99	12.6	2.63	7.0...11.5	2 ^m	T
1898.63	20.5	2.70	6.0...10.7	2 ^m	β

Discovered with the 6-inch. AUWERS gives the proper motion of this star as 0".025 in the direction of $36^{\circ}8'$. The position of the small star, if fixed in space, should be at the date of the last measures in 1898, $6^{\circ}2' : 2^{\circ}35'$. It is probable that the two stars are moving together.

[β (1)... β 1 Mon. Nov. XXXIII, 3511. β 2 (1)... Clm¹ L.M
...Tarrant (2991)...]

 β 513. 48 Cassiopeiae

R.A. 1^h 52^m 7^s
Decl. $-70^{\circ} 10'$

A and B

1878.69	265.0	1.05	5.0...7.0	1 ^m	J
1878.70	264.4	1.04	...	3 ^m	β
1879.23	264.5	0.96	5.0...7.0	1 ^m	O Σ
1879.56	265.6	1.00	...	8.0	2 ^m β
1881.67	271.9	0.76	...	7.5	1 ^m β
1883.78	269.7	1.07	...	7.0	5 ^m En
1885.77	284.9	...	...	...	1 ^m H Σ
1886.03	270.1	1.03	...	7.3	1 ^m T
1888.70	298.1	0.83	...	6.3	4 ^m β
1888.99	304.0	0.80	...	8	3 ^m Hi
1889.30	294.5	0.99	...	...	2 ^m T
1889.52	304.4	0.76	...	9	3 ^m β
1890.23	301.0	0.87	...	...	2 ^m T
1890.62	308.6	0.55	...	7.5	4 ^m β
1891.61	313.5	0.88	...	7.7	4 ^m β
1892.99	317.2	0.8	...	...	1 ^m Sp
1893.47	322.2	0.65	...	...	2 ^m Bat
1896.09	333.7	0.5 \pm	...	...	2 ^m Sp
1898.92	...	0.36	...	5.2	3 ^m A

A and C

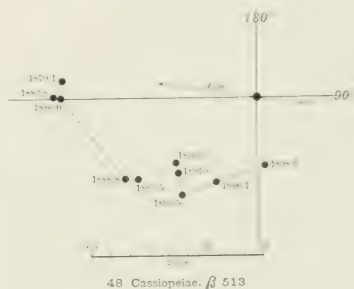
1878.80	49.4	23.98	1.35	1 ^m	β
1891.62	51.2	23.67	1.36	3 ^m	β
1898.78	50.3	23.81	1.30	3 ^m	β

A and D

1898.86 83.3 47.69 0.5 1^m β

This most interesting binary was discovered with the 18½-inch, but at that time it was easily seen with the 6-inch. It is now (1898) a very difficult object, and only measurable with a large aperture under the best conditions. The motion of the companion has been nearly a quadrant since the first measures, and it may prove to have a short period, but a much larger arc is required to give even a rough approximation of the orbit.

The principal positions are shown on the following diagram:

48 Cassiopeiae, β 513

AUWERS gives the proper motion of this star 0".069 in the direction of $262^{\circ}2'$. If the small star did not have this movement its position at the date of the measures in 1896 should be $08^{\circ}3' : 0^{\circ}16'$. It is obvious that the smaller star has the same proper motion, and at the same time a retrograde motion, around the principal star. If the change shown by the measures was due to the difference of two proper motions, it would have been an easy pair at the time of the observations of Σ and O Σ , and therefore catalogued as a double star long ago. It is probable that the distance at the time of discovery was about maximum.

18 100 8 37 30 47 4 27 28 57 48 1000
1891.1 100 100 102 102 102 102 102 102
1891.1 100 100 102 102 102 102 102 102
1891.1 100 100 102 102 102 102 102 102

direction of 277° . This would change only the distance of the companion. If the small star was fixed, the distance should have decreased $1''$ from 1880 to 1898. The measures show no material change in the position of B, so that it is certain, if this value of the proper motion is substantially correct, that the two stars are moving together, and probably make a physical system.

[β (XIII)... β^3 ... β (Observatory III, 582). (β 3114)... β (Puls. L. O. II)...]

β 1275. O. Arg. N. 2191

R.A. $2^h 6^m 21^s$
Decl. $+54^{\circ} 45'$

1898.66 203.7 3.20 7.5...13.0 4 u β

Discovered with the 40-inch in looking for the next pair, β 786.

β 786. D.M. (55) 503

R.A. $2^h 9^m 18^s$
Decl. $+55^{\circ} 12'$

1881.57 353.0 4.80 8.5...9.9 4 u β
1886.86 350.6 5.07 ... 2 n UL
1888.06 349.7 5.30 8.2...9.7 3 u Com
1898.60 351.1 5.20 8.5...8.7 2 n β

Discovered with the 15½-inch at the Washburn Observatory. There seems to be no material change.

[β (XII)... β^3 ...Updegraff, Lamb and Constock (*Puls. Washburn Obs.* v, vi)...]

β 1170. χ Perse

R.A. $2^h 9^m 39^s$
Decl. $+56^{\circ} 57'$

B and C

1890.74 313.3 0.27 11.5 11.7 3 u β

A and B

1879.53 352.6 70.47 11.8 2 u β
1890.74 353.3 70.39 6.2 11.8 3 u β
1898.60 353.0 70.22 6.3 10.7 2 u β

A and D of S 430

1824.99	136.5	124.53	1 n 8
1879.54	136.3	122.66	9.0 1 n β
1898.60	136.2	123.12	8.6 2 n β

The close pair was discovered with the 36-inch. It is a difficult pair even with that aperture. A is the principal star in the great cluster in *Perseus*. A and D make the double star, South 409. All the measures of this are given above.

The principal star has a proper motion of $0''.020$ in the direction of $239^{\circ} 8'$ (KRUEGER). The distant companions have no connection with it.

[β (XIII)... β^3 ... β (Puls. L. O. II)...]

β 437. Lacaille 1291

R.A. $2^h 12^m 26^s$
Decl. $+3^{\circ} 33'$

1877.95	32.4	7.16	8.0...12.5 2 u β
1879.00	29.0	5.81	8.0...12.0 1 u C 11
1891.96	33.4	7.19	8.0...11.3 3 u β
1898.73	31.7	7.12	8.3...11.5 1 u β

Discovered with the 1½-inch. The components appear to be relatively fixed.

[β (XIII)... β (*Am. Jour. Sci.*, July 1877)... β 3114)... β (Puls. L. O. II)...C 11...]

β 1171. D.M. (50) 350

R.A. $2^h 12^m 40^s$
Decl. $+56^{\circ} 18'$

1890.71 21.4 1.01 8.6...13.2 2 u β

Discovered with the 36-inch. In the great *Perseus* cluster; the s star of two about $1'$ apart. It is 9.2 m in D.M.

[β (XIII)... β^3 ... β (Puls. L. O. II)...]

β 875. γ Perse

R.A. $2^h 14^m 10^s$
Decl. $+58^{\circ} 18'$

1880.61	102.0	11.28	5.5...10.3 2 u β
1891.51	101.0	11.64	5.8...10.3 3 u β
1898.70	101.7	11.40	6.0...10.3 2 u β

Discovered with the 18½-inch. The proper motion, according to KRUEGER, is $0''.23$ in 1890.

direction of 241°.8. The measures show no relative motion, but it is probably only an optical pair.

β 85. (18 M, 117 + 113) ... (18 M, 117 + 113) ...

β 85. (18 M, 117 + 113)

R.A. ...
Decl. ...

1886.13	235.4	1.19	7.5...	12.3	4n	β
1891.87	235.1	1.04	7.7...	11.0	2n	β
1895.87	233.6	1.00	7.7...	11.0	1n	L
1898.74	237.3	1.17	...	...	2n	Hu

Discovered with the 6-inch. Apparently unchanged.

(*Sci. Men.* viii, 77)... Cogshall ()...

β 876. (18 M, 117 + 113)

R.A. ...
Decl. ...

β (18 M)

1886.13	235.4	1.19	7.5...	12.3	4n	β
1891.87	235.1	1.04	7.7...	11.0	2n	β
1895.87	233.6	1.00	7.7...	11.0	1n	L
1898.74	237.3	1.17	...	...	2n	Hu

Discovered with the 6-inch.

1886.13	235.4	1.19	7.5...	12.3	4n	Σ
1891.87	235.1	1.04	7.7...	11.0	1n	Ma
1895.87	233.6	1.00	7.7...	11.0	3n	J
1898.74	237.3	1.17	...	...	4n	β
1898.74	237.3	1.17	...	...	2n	β
1898.74	237.3	1.17	...	...	1n	L
1898.74	237.3	1.17	...	...	1n	Hu

A and C

1886.13	235.4	1.19	7.5...	12.3	2n	Σ
1891.87	235.1	1.04	7.7...	11.0	1n	J
1895.87	233.6	1.00	7.7...	11.0	1n	β
1898.74	237.3	1.17	...	...	2n	β
1898.74	237.3	1.17	...	...	3n	Hu

Discovered with the 6-inch. The above are all

the measures of the Σ components. Evidently they are relatively fixed.

(*Sci. Men.* viii, 77)... Cogshall ()...
... Madler (*Fixstern-Systeme* I)... J (ii)...]

β 738. Lacaille 720

R.A. ...
Decl. ...

1879.20	182.6	0.64	7.5...	7.5	2n	β
1881.80	174.3	0.58	7.1...	7.4	3n	β
1886.00	184.1	0.70	7.1...	8	1n	Bd

Discovered with the 6-inch at Mt. Hamilton in 1879. The magnitude in LACAILLE is $6\frac{1}{2}$, and $7\frac{1}{4}$ in GOULD. PORTER gives the proper motion 0.165 in the direction of 217°.3. It is obvious that this is common to both components. The relative motion is slow.

(*Sci. Men.* viii, 77)... Cogshall ()...]

β 517. *Citi* 374

R.A. ...
Decl. ...

A and B

1877.99	248.4	16.82	7.5...	12.5	1n	β
1878.99	247.4	16.84	6.7...	12.5	3n	β
1898.69	248.6	11.13	7.6...	19.5	2n	β
1898.76	248.8	11.33	7.0...	12.9	2n	A
1898.91	248.4	11.37	6.8...	19.5	1n	Bd

A and C

1878.99	248.6	54.97	...	11.5	1n	β
1898.69	249.1	55.51	...	16.5	2n	β
1898.76	249.0	56.29	...	12.2	2n	A
1898.91	249.2	56.11	...	9.5	1n	Bd

Discovered with the $18\frac{1}{2}$ -inch. There seems to be no material change. The principal star is Lacaille 4486.

(*Sci. Men.* viii, 77)... Cogshall ()...]

β 739. O. Arg. S. 13.42

R.A. $2^h 19^m 38.9$
Decl. $-36^{\circ} 24'$

1879.68	264.5	2.13	8.1...	8.7	3 ^m	β
1891.77	266.0	1.45	8.1...	8.4	3 ^m	β
1897.04	261.4	1.69	...	...	2 ^m	A

Discovered with the 6-inch on Mt. Hamilton in 1879. There is but little, if any, change.

[β (XI)... β ... β (3144)... β (Phe. L. O. II) (Aiken (3465)...)]

 β 1172. D.M. (56') 635

R.A. $2^h 21^m 27.7$
Decl. $+50^{\circ} 42'$

1890.71	238.3	1.64	8.4...	10.9	3 ^m	β
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Discovered with the 36-inch; in the borders of the cluster in *Perseus*.

[β (XVII)... β (3947)... β (Pab. L. O. II)]

 β 518. Ceti 389

R.A. $2^h 28^m 11.7$
Decl. $-9^{\circ} 23'$

1878.00	138.4	1.57	6.5...	11.0	3 ^m	β
1891.75	138.7	1.70	6.4...	11.3	3 ^m	β

Discovered with the 18½-inch. A naked-eye star in *Cetus*. It has no appreciable proper motion. B.A.C. 764.

[β (X)... β ... β (3114)... β (Pab. L. O. II)]

 β 519. W. II. 307

R.A. $2^h 23^m 38.9$
Decl. $-21^{\circ} 48'$

1877.95	61.2	...	8.5	10.0	1 ^m	Cin
1878.40	58.8	0.80	8.2...	9.7	2 ^m	β
1886.69	55.2	1.17	8.3...	9.5	3 ^m	LM
1891.86	54.4	0.69	8.3...	8.9	2 ^m	β
1898.79	50.2	0.86	8.2...	9.2	3 ^m	A
1898.91	57.5	0.93	8.5	9.3	3 ^m	Bd

Discovered with the 18½-inch. Change is uncertain.

[β (X)... β ... β (1114)... β (Phe. L. O. II)]

LM...Aitken ()...Boothroyd ()...

 β 304. Lacande 4693

R.A. $2^h 24^m 3.7$
Decl. $-36^{\circ} 50'$

1878.90	282.3	17.00	7.5	11.5	1 ^m	β
1880.77	283.9	18.02	7.5	11.5	1 ^m	β
1891.99	282.8	19.09	7.7	11.2	2 ^m	β
1898.18	282.4	19.30	...	...	2 ^m	β

Discovered with the 6-inch. The distance is increasing, and the change in a pair of this kind would be almost necessarily due to proper motion. The measures indicate an annual movement of about 0.08 in the direction of 102°.

[β (VI)... β ... β (2923, 3114)... β (Phe. L. O. II)]

 β 520. Lacande 4858

R.A. $2^h 28^m 42.7$
Decl. $-41^{\circ} 36'$

1877.90	270.2	20.78	8.0	10.5	1 ^m	β
1888.94	199.8	0.89	8.6...	10.5	1 ^m	LM
1898.81	201.7	0.902	8.4	10.02	4 ^m	A
1898.82	200.78	0.88	8.5	10.4	2 ^m	Bd

Discovered with the 6-inch.

β (X)... β ...LM...Aitken ()...Boothroyd ()...

 β 305. Lacande 4858

R.A. $2^h 28^m 55.7$
Decl. $-41^{\circ} 37'$

1875.82	205.2	20.80	7.0	11.2	1 ^m	β
1888.71	205.5	20.77	7.4	10.7	2 ^m	β

Discovered with the 6-inch. The measures by J, given above, are credited by him to β 304, which is in the same vicinity. LACANDE 4858.

[β (VI)... β ... β (2923, 3097)... β (Phe. L. O. II)]

β 524. 2nd time

Table 1		Table 2	
Time	Time	Time	Time
1800.0	1800.0	1800.0	1800.0
1800.5	1800.5	1800.5	1800.5
1801.0	1801.0	1801.0	1801.0
1801.5	1801.5	1801.5	1801.5
1802.0	1802.0	1802.0	1802.0
1802.5	1802.5	1802.5	1802.5
1803.0	1803.0	1803.0	1803.0
1803.5	1803.5	1803.5	1803.5
1804.0	1804.0	1804.0	1804.0
1804.5	1804.5	1804.5	1804.5
1805.0	1805.0	1805.0	1805.0
1805.5	1805.5	1805.5	1805.5
1806.0	1806.0	1806.0	1806.0
1806.5	1806.5	1806.5	1806.5
1807.0	1807.0	1807.0	1807.0
1807.5	1807.5	1807.5	1807.5
1808.0	1808.0	1808.0	1808.0
1808.5	1808.5	1808.5	1808.5
1809.0	1809.0	1809.0	1809.0
1809.5	1809.5	1809.5	1809.5
1810.0	1810.0	1810.0	1810.0
1810.5	1810.5	1810.5	1810.5
1811.0	1811.0	1811.0	1811.0
1811.5	1811.5	1811.5	1811.5
1812.0	1812.0	1812.0	1812.0
1812.5	1812.5	1812.5	1812.5
1813.0	1813.0	1813.0	1813.0
1813.5	1813.5	1813.5	1813.5
1814.0	1814.0	1814.0	1814.0
1814.5	1814.5	1814.5	1814.5
1815.0	1815.0	1815.0	1815.0
1815.5	1815.5	1815.5	1815.5
1816.0	1816.0	1816.0	1816.0
1816.5	1816.5	1816.5	1816.5
1817.0	1817.0	1817.0	1817.0
1817.5	1817.5	1817.5	1817.5
1818.0	1818.0	1818.0	1818.0
1818.5	1818.5	1818.5	1818.5
1819.0	1819.0	1819.0	1819.0
1819.5	1819.5	1819.5	1819.5
1820.0	1820.0	1820.0	1820.0
1820.5	1820.5	1820.5	1820.5
1821.0	1821.0	1821.0	1821.0
1821.5	1821.5	1821.5	1821.5
1822.0	1822.0	1822.0	1822.0
1822.5	1822.5	1822.5	1822.5
1823.0	1823.0	1823.0	1823.0
1823.5	1823.5	1823.5	1823.5
1824.0	1824.0	1824.0	1824.0
1824.5	1824.5	1824.5	1824.5
1825.0	1825.0	1825.0	1825.0
1825.5	1825.5	1825.5	1825.5
1826.0	1826.0	1826.0	1826.0
1826.5	1826.5	1826.5	1826.5
1827.0	1827.0	1827.0	1827.0
1827.5	1827.5	1827.5	1827.5
1828.0	1828.0	1828.0	1828.0
1828.5	1828.5	1828.5	1828.5
1829.0	1829.0	1829.0	1829.0
1829.5	1829.5	1829.5	1829.5
1830.0	1830.0	1830.0	1830.0
1830.5	1830.5	1830.5	1830.5
1831.0	1831.0	1831.0	1831.0
1831.5	1831.5	1831.5	1831.5
1832.0	1832.0	1832.0	1832.0
1832.5	1832.5	1832.5	1832.5
1833.0	1833.0	1833.0	1833.0
1833.5	1833.5	1833.5	1833.5
1834.0	1834.0	1834.0	1834.0
1834.5	1834.5	1834.5	1834.5
1835.0	1835.0	1835.0	1835.0
1835.5	1835.5	1835.5	1835.5
1836.0	1836.0	1836.0	1836.0

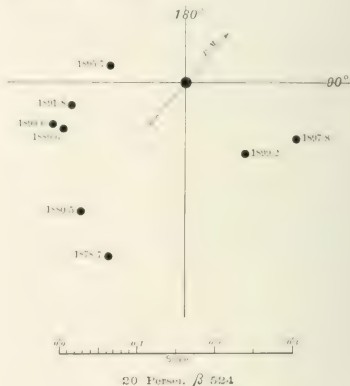
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1851.1	238.8	14.08	5.5...	10.0	29	Σ
1851.70	238.8	14.08	5.6...	9.0	19	0
1851.70	236.4	14.04			19	β
1880.82	236.9	14.00		8.8	19	β
1881.08		14.02			29	β
1890.61		14.08			39	β
1890.82	237.3	14.00			39	β

The duplicity of the principal star was discovered with the 18 $\frac{1}{2}$ -inch. It is at all times a difficult pair, and the motion is rapid. It is now known to be one of the most interesting binaries in the heavens. The distance never much exceeds 0.2, so that it is always a difficult pair, and beyond the reach of most telescopes. With the measures down to 1891 I made an attempt to find an approximate orbit, which gave a period of 27.7 years, and GLASNAPE, from the same apparent ellipse, found substantially the same elements. These results are of somewhat doubtful value from uncertainty in the adjustment of the measures as to quadrants. As the components are of about the same magnitude, some of the angles may require a correction of 180°. It is possible that all the positions since 1891 should be in the first quadrant, and that being so, the distance should gradually increase until the first revolution since discovery is completed. The apparent orbit will be very eccentric, and the period

probably more than 20 years. Even if the described arc is not less than 270° , as it would appear from the most probable arrangement of the measures, the data would be insufficient for even an approximate determination of the orbit, as there would be nothing to define the limits of the apparent ellipse in the unexpired part of the orbit. The measures of the next few years will remedy this, and furnish material for getting the elements of the orbit with substantial accuracy.

In the following diagram I have given the principal measures with what seems now to be the most probable arrangement with reference to each other. The measures of the next few years will determine the form of the orbit:



AUWERS gives the proper motion of 20 *Persei*, $\mu_{\alpha}^* 0.81$ in the direction of $141^\circ.1$. This would change the position-angle of C more than 20° in the interval covered by the measures if that star was fixed in space. As the measures show no relative change, the Herschel companion must be a member of the system.

β 000 β β β β (2957, 3048, 3144) β (*Pas. I* 0, 1, pp. 41, 42) β (*Le. I*, p. 81), pp. 1. Engelmann (2678)...Barnard (*A. J.* 447)...See (*A. J.* 359)...Lewis (*M. N. A. S. L.*, pass. Atkin. c. 1). Glasenapp (*Bot. Z. A. P.* XII, 499)...H Σ ()...]

There are other measures than those cited of the wide part of H^1 in G_2 : $S = 42\%$, $\Sigma = 318$. All

β 11. ρ : : :

Dec. 11, 1901.

Year	Age	Sex	Length	Weight	Species
1887.82	87.2	♂	5.4...	28	J
1887.82	87.2	♂	5.5...	28	C
1888.86	86.5	♂	6.0...	10.2	W
1888.86	86.5	♂	5.8...	9.0	W
1889.84	84.2	♂	6.2...	9.2	LM
1887.88	89.5	♂	5.0...	10.0	T
1888.05	84.5	♂	5.0...	10.3	T
1888.86	86.0	♂	6.5...	6.8	W
1891.80	84.8	♂	2.04	4.2	Col
1890.84	83.8	♂	6.2...	11.3	W

Discovered with the 6-inch. There appears to be no sensible change in either angle or distance. This star has no appreciable proper motion.

2091)... Collins (*Proc. Haverford Coll. Obs.*, 1891)...
Gogshall (...)]

β 1174. [unclear] [unclear]

100

1890.82	305.9	1.22	7.7...11.3	34	β
1895.69	...	...	...	19	β

Discovered with the 12-inch. The principal star has a considerable proper motion :

The measures are sufficient to show that this is a physical system, since the two stars are moving together.

[$\beta(1111) \dots \beta(3047) \dots \beta(Pub. L. O. 11) \dots$]

β 1175. *Enallagma cyathigerum*

1990	10.1	1.0
1991	10.1	1.0
1992	10.1	1.0

1970 68 280.9 0.26 7.3... 8.7 3m β

Discovered with the 36-inch.

[β (xvii) ... β (3047) ... β (*Pub. L. O.* 11) ...]

β 526. β *Persia* (Mog.)

R.A. 5 22 1
Decl. 0 40 30 5

Amidst

1878.81	155.3	59.06	Var. . . 12.7	3 <i>m</i>	β
1891.97	155.4	57.48	. . . 13.5	2 <i>m</i>	β
1898.96	155.4	58.79	. . .	1 <i>m</i>	β

A and C

1878.81	144.8	68.27	12.5	3 <i>n</i>	<i>f</i>
1891.97	144.3	68.38	14.2	1 <i>n</i>	<i>f</i>
1898.96	144.8	67.19		1 <i>n</i>	<i>f</i>

A and B

1879.30	192.6	81.91	... 10.5	4 <i>n</i>	β
1881.07	192.5	81.51	... 11.0	2 <i>n</i>	β
1898.96	192.4	81.78	... 11.5	1 <i>n</i>	β

12 and 13.

1878.81	116.2	10.80	... 12.5	3 <i>n</i>	β
1891.97	115.0	11.52	... 12.5	2 <i>n</i>	β
1898.96	118.0	11.95	... 12.0	1 <i>n</i>	β

The faint stars near the well-known variable *Algol* were noted with the 18½-inch. No elongation of the principal star, or any close companion, could be seen with the 36-inch under favorable conditions. The large star has a small proper motion, 0.013 in the direction of 242° 3 (AUWERS). There is no possibility of these faint stars being other than optical companions.

$$\beta \in \mathcal{B} \quad \beta' \in \mathcal{B} \quad \beta \neq \beta' \quad \beta \in \{1111\} \quad \beta \in \{Pmb, I, (0, 11)\} \quad \beta \in \{1111\}$$

β 527. W' II, 1957

K.A.	3	6.5	25	1
Decl	13	13'	5	

1877.83	60.4	0.85	8.0...	8.5	1n	β
1877.93	63.6	0.76	7.8...	8.3	1n	Cin
1892.03	66.0	0.83	8.1...	8.4	3n	β
1898.88	65.3	0.81	8.2...	8.2	3n	Bd

Discovered with the 18½-inch; closely *sp* Σ 356.

$$[\beta(1), \dots, \beta(\ell)] = \beta(1) + \beta(2) + \dots + \beta(\ell) = (I' u^k - I'(0, 1)) = 0 \text{ m}^4 \quad \text{Booth}$$

β 528. W. H. 1086

R.A. 3 25 25.7
Decl. - 4 3 3

1877.97	197.5	1.01	8.5...	8.5	29	β
1886.84	12.5	0.91	8.2...	8.3	19	LM
1889.02	197.3	...	8.5...	8.6	19	Lv
1891.72	195.4	1.00	...	...	19	Col
1898.82	197.6	0.95	8.8...	8.8	39	Cg

Discovered with the 18 $\frac{1}{2}$ -inch. In the field with Σ 358.

[β (x)... β ...LM...L... Collins (*Proc. Haverford Coll. Obs.*, 1891)...Cogshall (...)]

 β 1030. W. H. 1112

R.A. 3 40 12.7
Decl. +21 17 3

1888.83	164.6	0.58	8.4...	8.4	39	β
1890.64	168.9	0.5...	...	...	109	Sp
1895.92	165.0	0.71	...	...	29	Lew
1896.52	161.7	0.48	...	...	29	Lew
1897.89	162.6	0.53	...	...	29	Lew
1897.93	160.0	0.76	...	...	39	A
1898.11	159.9	0.42	...	...	19	Lew
1898.12	154.2	0.48	...	...	19	Bow

Discovered with the 36-inch. The measures taken together do not indicate any sensible motion.

[β (xiv)... β (2875)... β (*Pub. L. O. II*)...Sp (m)...Lewis (*Mon. Not. LIX*, 381) (*Astronomical Observer*, 1885)...Atken (*A. J.*, 429)...Lewis and Bowyer (*Mon. Not. LIX*, 400)...]

 β 1176. 48 *Cephei* (11)

R.A. 3 5 9.7
Decl. +77 17 3

A and B

1890.65	277.6	1.18	5.7...	4.5	39	β
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A and C

1890.65	227.0	1.095	...	1.3	29	β
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Discovered with the 36-inch. The close pair is difficult. The principal star (B.A.C. 979) has a proper motion, according to AUWERS, of 0.073 in the direction of 137°. A measure of AB at this time would show at once whether this movement is common to both components.

[β (xv)... β (3114)... β (3114)... β (3114)... β (3114)...]

 β 400. *Iridium* 1075

R.A. 3 5 18.7
Decl. - 4 18 3

1877.95	53.2	21.69	7.0	11.5	19	β
1879.01	53.1	22.19	6.4...	12.0	39	β
1891.96	54.1	22.74	7.00...	11.7	29	β
1898.73	53.7	22.61	6.2...	11.7	29	β

Discovered with the 6-inch. This is a naked-eye star, Heis 6 m (= Lalande 5925 = W. III. 50).

[β (x)... β (2104)... β (3114)... β (3114)... β (3114)...]

 β 530. *Arctis* 161

R.A. 3 7 18.7
Decl. +22 50 3

B and C

1879.21	195.8	1.77	9.7...	10.4	49	β
1892.00	194.2	1.70	9.7...	10.1	39	β
1896.85	...	1.68	...	...	19	Bow
1896.93	197.0	1.84	...	...	19	Lew
1898.11	193.3	2.23	...	...	19	Lew
1898.75	194.0	1.66	8.7...	9.2	29	β

A and B = Σ 300 001

1879.21	41.3	48.88	7.0...	...	49	β
1892.00	40.9	48.40	7.8...	...	29	β
1898.75	40.8	48.08	7.1...	...	29	β

The distant companion of this rejected pair of Σ was found to be double with the 18 $\frac{1}{2}$ -inch. Thus far the measures indicate no change. The above are all the measures of AB. Lalande 5061.

[β (x)... β ... β (3114)... β (*Pub. L. O. II*)...Lewis and Bowyer (*Mon. Not. LIX*, 400)...]

 β 520. *Iridium* 1075

R.A. 3 5 18.7
Decl. - 4 18 3

1877.89	220.0	2.40	8.0...	12	29	β
1891.80	220.4	3.41	8.0...	11.2	39	β
1898.70	220.1	2.14	8.8...	11.5	19	β
1898.82	220.7	3.8	7.4...	13.7	29	Cg

Discovered with the 18 $\frac{1}{2}$ -inch.

[β (x)... β (3114)... β (3114)... β (3114)... β (3114)...]

β 1179. 34 *Persei*R.A. γ 20^h 47^m 1
Decl. $+\gamma$ 6 $^{\circ}$ 5'1890.64 163.4 0.68 5.9...11.6 4ⁿ β
1898.73 164.5 0.70 ... 3ⁿ III

Discovered with the 36-inch. A difficult pair. The proper motion of this star is 0.034 in the direction of 175° (AUWERS). The measures show that this is common to both stars.

[β (XVII)... β (3047)... β (Pub. L. O. II)... Hussey] **β 878.** 60 *Arctis*R.A. γ 21^h 28^m 1
Decl. $+\gamma$ 22 $^{\circ}$ 23'1881.06 78.0 1.10 6.0...12.2 2ⁿ β
1890.89 76.1 1.29 5.8...13.7 3ⁿ β
1897.88 74.1 1.05 ... 1ⁿ Lew

Discovered with the 18½-inch. A more difficult pair than the distance and magnitude would indicate. This star has a considerable proper motion:

Auwers	...	0.120	10	188.3
Porter	...	0.115	10	186.9

It is apparent from the measures that this is a physical pair. If the small star was fixed in space, the proper motion of A in the interval would decrease the position-angle 36°, and add 0.7 to the distance.

[β (XIII)... β (3048)... β (Pub. L. O. III)... Lewis (M.N. Aug. LX, 400)...] **β 879.** R.A.C. 1076R.A. γ 22^h 5^m 1
Decl. $+\gamma$ 48 $^{\circ}$ 5'1878.98 71.1 24.05 6.5...12.5 3ⁿ β
1898.72 70.4 24.50 6.5...11.2 2ⁿ β
1898.76 71.8 24.70 6.5...12.2 2ⁿ A

A distant attendant noted with the 18½-inch. Lalande 6400.

[β (XIII)... β ... Attkin (...)] **β 1180.** Lalande 6417R.A. γ 22^h 5^m 1
Decl. $+\gamma$ 48 $^{\circ}$ 5'

A and B

1890.82 24.8 0.44 8.3... 9.5 3ⁿ β

A and C

1890.82 117.9 7.13 ... 11.5 3ⁿ β 1899.09 119.4 7.47 ... 11.5 2ⁿ β

Discovered with the 36-inch.

[β (XVII)... β (3048)... β (Pub. L. O. II)...] **β 787.** Lalande 6473R.A. γ 25^h 19^m 1
Decl. $+\gamma$ 18 $^{\circ}$ 15'

1881.69	228.5	2.05	8.0...	12.0	3 ⁿ	β
1885.96	227.3	2.35	...	...	1 ⁿ	HS
1888.59	233.1	2.02	7.9...	12.4	3 ⁿ	Com
1898.70	245.6	2.39	...	...	1 ⁿ	HS
1899.13	243.5	2.40	8.0...	11.5	1 ⁿ	β

Discovered with the 15½-inch at the Washburn Observatory. There seems to be some change in the angle.

HUSSEY measures a third star, 175° 8 : 12.70 (1898.70) 1ⁿ. I could not see this on one night with the 40-inch, but measured 11ⁿ star in nearly the same direction, 175° 6 : 36.78 (1899.13) 1ⁿ.

[β (XIII)... β ... Comstock (Pub. Washburn Obs. VI, 112) ... Hussey] **β 788.** D.M. 112 1780R.A. γ 27^h 1^m 1
Decl. $+\gamma$ 52 $^{\circ}$ 11'

A and B

1881.69 306.2 2.78 8.3...10.5 1ⁿ β
1888.06 306.2 2.00 8.5...10.2 3ⁿ Com

A and C

1881.69 82.2 34.34 ... 8.8 1ⁿ β
1887.00 82.4 34.00 ... 8.8 3ⁿ Com

Discovered with the 15½-inch at the Washburn Observatory.

[β (XI)... β ... Comstock (Pub. Washburn Obs. VI)...]

β 534. Lalande 6711

R.A. 8^h 33^m 1^s 0
Decl. - 8° 54' 0"

1879.24	195.3	2.40	7.5	11.1	4 ⁿ β
1891.86	193.1	2.58	8.0	11.7	2 ⁿ β
1898.87	194.1	2.60	8.0	12.5	2 ⁿ Rld

Discovered with the 18½-inch. No material change.

[β (XII)...β (3114)...β (Pub. L. O. II)...Bathurval
(...)]

β 1182. Lalande 6759

R.A. 3^h 48^m 30^s 0
Decl. - 48° 8' 0"

A and B

1890.62	261.2	4.37	6.4	14.2	3 ⁿ β
1898.71	260.4	4.45	...	...	1 ⁿ Hu

A and C

1890.62	242.0	19.27	...	13.5	3 ⁿ β
1898.71	242.8	18.76	...	...	1 ⁿ Hu

Discovered with the 36-inch. BATTERMAN (A.N. 3507) gives the proper motion of this star, 0.028 in the direction of 18671.

[β (XVII)...β (3047)...β (Pub. L. O. II)...Hussey (...)]

β 535. o. 38 *Persei*

R.A. 3^h 30^m 47^s 0
Decl. - 51° 54' 0"

1877.84	60.5	0.60	...	...	1 ⁿ J
1878.25	56.8	0.83	4.0	...	4 ⁿ β
1879.69	53.2	0.67	4.0	...	1 ⁿ β
1888.42	51.1	0.97	...	...	5 ⁿ HΣ
1888.71	59.2	1.09	...	...	3 ⁿ β
1890.10	50.1	1.00	...	...	3 ⁿ I
1890.61	49.7	0.87	...	...	5 ⁿ Sp
1891.10	56.3	0.90	...	...	1 ⁿ Bld
1894.30	48.2	0.97	...	...	7 ⁿ HΣ

Discovered with the 18½-inch. The measures are not very accordant, but the motion, if any, is very slow. AUWERS gives the annual movement of this star, 0.023 in the direction of 24378, so that with the small star stationary, the distance between the components, would increase by this amount

annually, and at this time (1898) the distance should be about 175. It is obvious from the measures that the two stars are moving together.

[β (X...β (3114)...β (Pub. L. O. II)...Tarrant
(3186)...Bigourdan (Bul. Astr. XVIII)...Sp (III)...HΣ
(...)]

β 880. D.M. 311 1634

R.A. 3^h 37^m 3^s 0
Decl. - 31° 47' 0"

A and B

1880.90	353.7	0.45	8.7	...	8.9	2 ⁿ β
1891.69	354.7	0.51	8.4	...	8.4	3 ⁿ β
1898.12	340.2	0.40	...	...	...	1 ⁿ Bow
1898.76	354.9	0.55	8.5	...	8.5	1 ⁿ β
1898.97	340.9	0.42	...	...	...	1 ⁿ L

AB and C = Σ 439

1830.99	38.1	23.20	8.0...	9.2	2 ⁿ	Σ
1866.85	38.3	23.39	7.8...	9.0	3 ⁿ	J
1879.82	38.0	23.70	8.0...	9.1	2 ⁿ	β
1891.69	38.3	23.42	...	9.2	3 ⁿ	β
1898.82	38.2	23.46	8.5...	8.9	2 ⁿ	β

The duplicity of the principal star of Σ 439 was discovered with the 18½-inch. It is near the last preceding pair, 38 *Persei*. There is no change in the distant star. A few of the measures are given.

[β (XIII)...β (3114)...β (Pub. L. O. II)...M...
Olin, XIII, XV) (Fixstern-Systeme 1)...J (II)...Cin⁶...
Lewis and Bowyer (Mon. Not. LIX, 400)...]

β 1041. W. H. 713 705

R.A. 3^h 37^m 3^s 0
Decl. - 27° 31' 0"

B and C

1888.61	347.5	7.87	...	...	...	3 ⁿ β
1898.71	338.8	10.14	...	...	...	2 ⁿ β
1898.76	348.4	6.84	...	...	...	2 ⁿ A

A and B = OΣ 409 180

1875.11	39.3	124.03	0.4	...	...	3 ⁿ J
1888.61	39.6	124.57	7.0	...	...	3 ⁿ β
1897.78	40.0	124.03	6.5	...	...	4 ⁿ I
1898.71	40.0	124.37	...	...	...	2 ⁿ β
1898.72	40.0	124.48	7.5	...	...	3 ⁿ A

The minute companion to the preceding star of this wide pair was discovered with the 36-inch.

β 1184. D.M. (21) 1526

R.A. $3^h 41^m 14^s$
Decl. $+22^\circ 0' 3''$

1890.83	272.2	0.62	8.1	8.3	3 ^m β
1893.07	269.6	0.75			1 ^m Sp
1896.08	267.8	0.5			4 ^m Sp
1897.86	273.8	0.59			1 ^m Lew
1897.88	266.3	0.73			3 ^m A
1897.92	264.7	0.48			2 ^m Bow
1898.12	275.2	0.62			1 ^m Bow

Discovered with the 36-inch. Very little, if any, change.

[β (xvii)... β (3047)... β (Pub. L. O. II)...Sp (III)...Aitken (A. J. 429)...Lewis and Bowyer (Mon. Not. LIX, 400)...]

 β 1105. D.M. (23) 554

R.A. $3^h 42^m 26^s$
Decl. $+23^\circ 49' 3''$

1889.62	57.7	0.33	0.3	10.3	3 ^m β
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Difficult pair in the *Pleiades*, 1^m 4^s f and 4^s 3 n of η *Tauri* (ALCONE). Discovered with the 36-inch.

[β (xvi)... β (2050)... β (Pub. L. O. II)...]

 β 1106. *Pleiades*

R.A. $3^h 42^m 58^s$
Decl. $+23^\circ 51' 3''$

1889.59	51.7	0.40	11.5	11.5	1 ^m β
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Another difficult pair in the *Pleiades*, discovered with the 36-inch. It is too faint for the D.M. The place is taken from the Paris map of this group. It is 55^s f and 4^s 6 n of 28 *Tauri* (PLEIONE).

[β (xvi)... β (2056)... β (Pub. L. O. II)...]

 β 539. W. III. S. 34

R.A. $3^h 43^m 13^s$
Decl. $+1^\circ 53' 3''$

1877.88	271.2	2.79	9	11	2 ^m β
1891.86	271.6	2.69	8.3	10.6	2 ^m β

Discovered with the 18½-inch. Near β 481 Unchanged.

[β (x)... β (3114)... β (2045) β (L. O. II)...]

 β 401. Lalande 7109

R.A. $5^h 44^m 12^s$
Decl. $+1^\circ 43' 3''$

1877.20	254.5	4.65	6.8	10.8	3 ^m J
1878.05	255.8	4.37	6.5	10.0	1 ^m Cin
1879.77	255.8	4.00	6.0	10.0	1 ^m Cin
1891.86	256.0	4.64	6.7	11.1	2 ^m β

Discovered with the 6-inch. Evidently fixed.

[β (vii)... β (2103,3114)... β (Pub. L. O. II)...4 (i)...Cin5 ...Cin5...]

 β 743. D.M. (51) 1802

R.A. $5^h 45^m 30^s$
Decl. $+51^\circ 54' 3''$

1886.06	250.2	0.82	8.5	9.2	1 ^m β
1891.77	249.1	0.74	8.2	9.0	3 ^m β

Discovered with the 6-inch in 1879 on Mt. Hamilton.

[β (xi)... β ... β ... β (3114)... β (Pub. L. O. I, II)...]

 β 1276. Lalande 7100

R.A. $5^h 47^m 14^s$
Decl. $+2^\circ 12' 3''$

B and C

1898.73	81.1	0.06	8.7	9.0	3 ^m β
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A and BC ($\approx \Sigma 468 = H 3158$)

1823+	105	23.8	8	9	1 ^m H
1831.40	97.7	20.20	8.7	9.7	3 ^m Σ
1844.13	98.5	19.37			1 ^m M1
1868.57	98.0	20.03	8.7	9.7	4 ^m J
1879.66	97.1	20.80	8.5	9.5	3 ^m Cin
1892.02	97.7	19.35	8.1	9.0	2 ^m G
1898.73	97.7	20.13	8.2		3 ^m β

Discovered with the 40 inch. It is not a difficult pair, and should have been seen before with the present distance. The STRUVE components are evidently fixed. The foregoing are all the measures. A and B are respectively S.D. (2°) 745 and 746.

[Maddler (Fixstern-Systeme I)...J (II)...Cin...Glasekapp... (III)...]

B and C

1888.92	35.1	1.59	7.7	9.5	3 <i>m</i>	β
1898.73	38.1	1.61	8.8	10.8	3 <i>m</i>	β
1898.80	35.3	0.97	9.8	10.5	1 <i>m</i>	A

Discovered with the 36-inch. So far there appears to be no change in the close pair.

[β (xv)... β (2929)... β (*Pub. L. O. II*)...Glasenapp (ii)...Aitken ()...]

 β 544. 3*m* *Tamm*

R.A.	3 57 11
Decl.	+ 28 46

1877.86	257.9	25.06	6.0...	12.5	1 <i>m</i>	β
1892.04	256.6	26.10	5.5...	13.2	3 <i>m</i>	β
1897.84	256.7	25.17	...	...	3 <i>m</i>	β

Discovered with the 18½-inch. The proper motion of this star is small, 0.012 in the direction of 214°5 (AUWERS).

[β (x)... β (3114)... β (*Pub. L. O. II*)...]

 β 1004. Lacaille 1329

R.A.	3 57 27
Decl.	+ 28 48

A and B

1881.85	154.1	1.79	7.5	7.9	3 <i>m</i>	β
1895.08	144.8	1.54	7.0	8.5	3 <i>m</i>	See
1897.72	144.2	1.77	7.2	8.3	1 <i>m</i>	See
1898.84	143.4	1.97	7.0	7.7	2 <i>m</i>	A

A and C

1881.86	131.2	0.298	...	11.2	2 <i>m</i>	β
1898.84	134.6	60.04	...	11.7	2 <i>m</i>	A

Discovered with the 12-inch on Mt. Hamilton in 1881. There appears to be some change in the angle of AB. The change in C indicates a proper motion of 0.27 in the direction of 81°7.

[β (xiii)... β ...Sellors' (3369)...See (3495)...Aitken ()...]

 β 1277. D.M. 127 1069

R.A.	3 58 15
Decl.	+ 28 48

A and B

1898.84	259.0	1.34	8.5	10.2	2 <i>m</i>	β
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A and C

1898.87	259.7	54.53	...	12	3 <i>m</i>	β
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Discovered with the 40-inch in looking for the next pair, β 1005.

 β 1005. D.M. 128 1015

R.A.	3 58 27
Decl.	+ 28 47

1881.86	62.7	3.35	8.5...	11.7	2 <i>m</i>	β
1891.89	61.7	2.47	8.4...	12.0	3 <i>m</i>	β
1898.74	62.1	2.77	...	...	3 <i>m</i>	Hu
1898.84	60.8	2.56	...	...	2 <i>m</i>	β

Discovered with the 12-inch at Mt. Hamilton in 1881.

[β (xiii)... β (3114)... β (*Pub. L. O. II*)...]

 β 545. Lacaille 1329

R.A.	3 58 27
Decl.	+ 28 47

1878.24	310.0	1.02	8.0...	11.5	4 <i>m</i>	β
1890.79	310.1	1.09	8.0...	10.6	4 <i>m</i>	β
1891.78	309.3	1.05	8.3...	11.0	3 <i>m</i>	β
1898.82	303.6	1.04	8.1...	10.0	2 <i>m</i>	β

Discovered with the 18½-inch. There seems to be no material change. This star is in the field with O Σ 531. It has been used for the determination of the parallax of O Σ 531 by BALL (*Pub. Dunstun Obs.*, Part V). The last named star has a proper motion of 0.260 in the direction of 146°5 (PORTER). The following measures connect the two pairs:

 β 545 and 1277.

1881.16	25.4	238.79	2 <i>m</i>	O Σ
1884.04	28.6	238.28	3 <i>m</i>	O Σ
1888.20	28.8	238.73	2 <i>m</i>	O Σ
1897.00	27.3	237.32	3 <i>m</i>	Ball
1898.78	28.1	238.53	2 <i>m</i>	β
1898.82	28.8	234.95	2 <i>m</i>	β

[β (x)... β (3114)... β (*Pub. L. O. II*)...]

β 300. Lacaille 7833

R.A. $4^h 1^m 10^s$
Decl. $+38^\circ 35'$

1875.65	279.1	5.66	8.0...11.3	3 m	J
1876.00	279.2	5.66	8.0...11.3	2 m	H1
1890.00	276.8	5.04	8.0...10.5	3 m	H1
1899.09	277.1	5.59	8.0...10.5	1 m	β

Discovered with the 3-inch. Probably fixed.

[β (VI)... β (2002)...J (I)...Hall (I, II)...]

 β 1232. W 111 1290

R.A. $4^h 4^m 20^s$
Decl. $+28^\circ 42'$

1875.00	350.4	0.30	8.4...9.3	3 m	β
1893.07	355.7	0.25	8.4...9.3	1 m	Sp
1896.08	354.0	0.22	8.4...9.3	5 m	Sp
1898.00	353.2	0.36	8.4...9.3	1 m	L
1898.77	353.8	0.40	8.4...9.3	2 m	Hu
1898.89	353.8	0.43	8.4...9.3	1 m	L

Discovered with the 36-inch.

[β (XVIII)... β (3113)... β (Pub. L. O. II)...Sp (III)...Lewis (Mon. Not. LIX, 400)...Hussey (...)]

 β 546. W 111 1323

R.A. $4^h 5^m 10^s$
Decl. $+30^\circ 53'$

1878.67	24.4	0.92	8.0...8.0	1 m	β
1883.66	26.8	0.77	8.3...8.3	6 m	En
1896.07	26.4	0.82	8.3...8.3	2 m	Sp
1898.79	32.2	0.86	8.3...8.3	5 m	Hu
1898.88	210.7	0.69	8.3...8.5	1 m	β

Discovered with the 18½-inch. There may be some advance in the angle.

[β (X)... β (Engelmann (2678)...Sp. (III)...Hussey (...)]

 β 1233. W 111 1310

R.A. $4^h 5^m 47^s$
Decl. $+28^\circ 42'$

1875.00	350.4	0.30	8.4...9.3	3 m	β
1893.07	355.7	0.25	8.4...9.3	1 m	Sp

Discovered with the 12-inch. At first the principal star was suspected to be a close pair, but this was not verified with the large telescope. In D.M. 7.4 m; *Christiana Catalogue* 6.8 m.

[β (XVIII)... β (3113)... β (Pub. L. O. II)...]

 β 1278. Lacaille 7871

R.A. $4^h 7^m 0^s$
Decl. $+38^\circ 35'$

A and B

1893.85	303.4	7.45	0.5...13.7	3 m	β
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A and C

1898.02	252.3	55.20	12.5	1 m	β
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Discovered with the 40-inch in looking for 47 *Tauri*. The D.M. magnitude is 6.8.

 β 547. 47 *Tauri*

R.A. $4^h 7^m 25^s$
Decl. $+38^\circ 35'$

A and B

1877.84	359.4	0.80	5.5...8.0	3 m	β
1877.90	359.7	0.82	5.0...7.5	3 m	J
1878.93	359.8	0.89	5.0...9.0	3 m	β
1886.20	363.4	1.15	5.0...9.0	2 m	H1
1888.81	359.7	0.91	5.2...8.7	3 m	β
1889.03	358.6	0.75	5.0...8.0	3 m	Sp
1889.02	359.5	0.94	5.0...8.0	3 m	T
1889.11	359.3	0.94	5.0...8.0	1 m	Lv
1896.70	353.4	0.91	5.3...9.0	3 m	A
1898.80	361.4	1.07	5.5...8.0	2 m	β

AH and C

1877.99	223.1	32.20	12.5	1 m	β
1898.82	224.5	31.56	13.3	3 m	β

Discovered with the 18½-inch. A fine pair, but the change, if any, is very slow. The proper motion of this star is small, 0.050 in the direction of 227°5 (AUWERS), but it is sufficient to show that it is common to both stars, as otherwise there would be a decided change in both angle and distance.

The distant companion appears to be fixed in space. With the position of C from the measures of 1898, and the proper-motion of A given above,

β 184. Lalande 8474

R.A. $1^h 22^m 45^s$
Decl. $-21^{\circ} 46'$

1877.53	262.5	1.10	6.2...	7.0	2 <i>m</i>	Cin
1889.01	261.4	1.12	6.5...	7.1	3 <i>m</i>	L.V.
1891.72	259.2	1.09	7.4...	7.6	1 <i>m</i>	L.V.
1895.90	259.8	...	...	...	3 <i>m</i>	Do
1897.76	240.4	1.30	7.4...	7.6	1 <i>m</i>	See
1899.00	257.8	1.10	...	...	1 <i>m</i>	β

Discovered with the 6-inch. No sensible change.
In Gould 6.9 m.

[β (1*v*)... β (*Mon. Not.* XXXIV, 282)...Cin...Lv...Lv
(*Proc. Haverford Coll. Obs.* 1891)...Doberck (3378)...
See (3495)...]

 β 549. W. 1*v*, 458

R.A. $1^h 24^m 2^s$
Decl. $-12^{\circ} 13'$

1877.97	189.0	7.85	8.0...	12.5	2 <i>m</i>	β
1879.11	185.0	...	7.9...	12.0	1 <i>m</i>	Cin
1891.86	190.5	8.66	7.8...	11.6	2 <i>m</i>	β
1898.71	189.2	8.44	8.3...	10.8	1 <i>m</i>	β
1898.91	188.8	8.52	7.2...	12.0	3 <i>m</i>	C ₂

Discovered with the 18½-inch. Without change.

[β (X1)... β (X14)... β (*Proc. L. O. O.*)...Cin...Cin...
shall (1...)]

 β 789. Lalande 8426

R.A. $1^h 23^m 36^s$
Decl. $+37^{\circ} 24'$

1881.69	322.6	1.30	8.1	8.8	3 <i>m</i>	β
1888.22	322.3	1.30	8.2...	9.0	3 <i>m</i>	Cin

Discovered with the 15½-inch at the Washburn Observatory. Probably fixed.

[β (X1)... β (Cin)... β (*Proc. H. O.*)...Cin...Cin...]

 β 746. Gould, G. C., 1007

R.A. $1^h 17^m 1^s$
Decl. $-38^{\circ} 1^s$

1879.79	3...	1.2±	8.0...	...	...	β
1895.00	11.9	1.05	7.9...	...	3 <i>m</i>	See

Discovered with the 6-inch at Mt. Hamilton in 1879. Later measures are needed.

[β (X1)... β ...Sellors (3369)...]

 β 747. Lalande 15115

R.A. $1^h 28^m 50^s$
Decl. $-38^{\circ} 32'$

1879.79	240...	...	7.5...	9.5	...	β
1891.79	248.4	...	7...	9	2 <i>m</i>	See

Discovered with the 6-inch at Mt. Hamilton in 1879.

[β (X1)... β (*Proc. L. O. O.*)...Sellors (3369)...]

 β 550 and β 1031. *a Tourmaline* DUBARAS

R.A. $1^h 24^m 2^s$
Decl. $-12^{\circ} 13'$

A and B (β 550)

1877.89	109.0	39.45	1...	1.5	3 <i>m</i>	β
1878.00	119.5	31.26	...	...	3 <i>m</i>	III
1880.11	111.2	31.49	...	14.0	2 <i>m</i>	β
1888.82	109.5	30.90	...	...	2 <i>m</i>	β
1890.87	109.0	31.34	...	14.2	3 <i>m</i>	β
1897.79	108.8	31.03	...	...	3 <i>m</i>	β
1898.10	109.7	31.30	...	...	3 <i>m</i>	A

C and D (β 1031)

1888.81	284.1	2.34	9.0...	12.0	3 <i>m</i>	β
1890.86	279.1	1.84	11.0...	13.5	4 <i>m</i>	β
1891.72	277.0	3.83	10.6...	13.7	4 <i>m</i>	β
1892.82	277.8	2.11	...	...	3 <i>m</i>	Bar
1897.82	276.9	1.62	...	...	3 <i>m</i>	β
1897.83	276.0	2.16	...	...	1 <i>m</i>	Bar
1898.10	275.7	1.74	9.5...	13.0	3 <i>m</i>	A
1899.02	278.5	1.59	9.0...	13	3 <i>m</i>	β

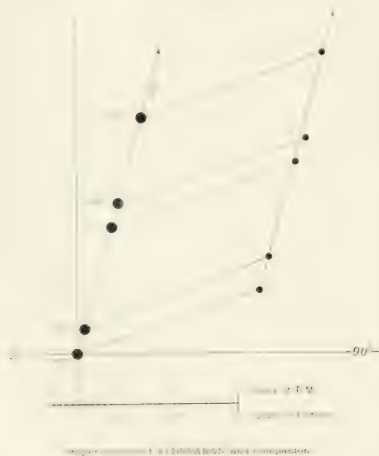
A and C (β 1031)

1836.06	36.0	109.04	...	...	2 <i>m</i>	β
1841.09	35.4	111.70	...	...	2 <i>m</i>	III
1844.21	34.8	110.77	...	...	2 <i>m</i>	β
1887.00	34.8	110.27	...	...	3 <i>m</i>	III
1888.02	34.6	110.27	...	...	3 <i>m</i>	β
1898.10	34.3	111.06	...	...	4 <i>m</i>	A
1899.02	34.6	111.00	...	...	3 <i>m</i>	β

The nearest comparison to *Hesperia* was found with the C₂ group of stars in the field and this is now shown to have the same proper motion as the principal star. A great deal would not be expected considering the distance and great difference in magnitude. Both distance and position

angle appear to have remained unchanged, the small difference in measure being fully accounted for by the extreme minuteness of the companion, and the difficulty of measuring it so near a first-magnitude star. It was a very difficult object to see with the Chicago telescope, and might easily be overlooked even with the 30-inch refractor.

The more distant Herschel companion has been observed for more than a hundred years, and the change shown by the measures has usually been ascribed solely to the proper motion of *Aldebaran*. The distinguished French astronomer, FLAMMARION, was the first to notice the fact that the



well-known proper motion of A could not account for the relative change, and therefore came to the conclusion that B must have a proper motion of its own, and in a different direction. Of the correctness of this view there can be no doubt, and the amount and direction of the relative displacement of C should be as well known as of most stars. This motion is almost exactly half that of A, and is larger than that of any known star as far as the eleventh magnitude, which is not considered as moving with some brighter component.

In looking at this object in 1888 with the 36-inch,

double, or had a very faint attendant a little more than 2' distant. This is too difficult for most telescopes.

That the proper motion of the faint star B is exactly the same as that of *Aldebaran* will be apparent from the foregoing diagram, showing the several positions of both stars from 1877 to 1898, as given by the measures. The annual proper motion of A is given by AUWERS as 0".190 in the direction of 164°.7. The several places of A along the line separating this movement are derived from this value of the proper motion, and the corresponding positions of B laid down from the measures. The scale of the distances AB is one-tenth that of the proper motion.

The wide pair, AC, is H. VI. 66 S. 152. 2 App. II. A few of the measures are given above. The early observations, made before the work of Σ, are not accurate in distance. The measures of AC, 1836-1898, taking into consideration the motion of A in space, give the annual proper motion of C as 0".094 in the direction of 112.2.

The diagram on opposite page, showing to scale the several positions of the three components is reproduced from *Monthly Notices*, March 1891.

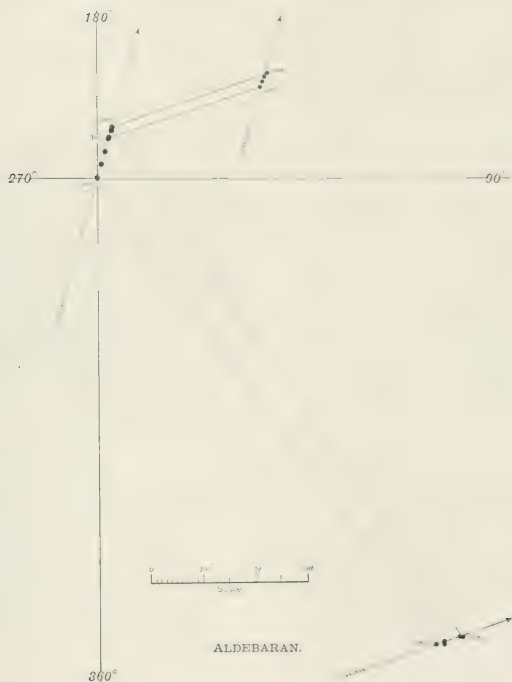
From the measures already made of C and D, it is practically certain that these two stars have a common proper motion, and therefore form a physical system. D appears to have a slow retrograde motion. Taking the relation of these stars as given by a mean of my three sets of measures at Mt. Hamilton, and applying the proper motion of C as given above, the position of D with reference to that star for 1898.10 should be 283°.0 : 2.85. The measures all concur in showing a diminishing position-angle, and no increase in the distance.

The minimum distance between these two interesting systems occurred about A. D. 1130, when the separation of A and C was only 40".

Σ 200, 1111	A	39	B	(1836) 2875.3098, 3111	B (Mon. Not. 11, 111)	B 7/10 A. C. 115	Barraud (Cat. I. 417)
Aldebaran						Barraud (Cat. I. 417)	

Other measures, etc., of the old stars, in addition to those given above, will be found in the catalogues of HERSCHEL I, SOUTH and STRUVE, and in the following:

Σ 200, 1111	(1836) 2875.3098, 3111	(Mon. Not. 11, 111)	(1836) 2875.3098, 3111	(Mon. Not. 11, 111)
(Poulkova Obs., x, p. 64)	Flammarion (L'Astronomie, IV, 1891)	Flammarion (L'Astronomie, IV, 1891)	Hall (11)	Hall (11)
(150)	(150)	(150)	(150)	(150)

 **β 881.** *4th Eridani*

R.A. 1 29 41.1

Decl. 7 9 3

1879.02	57.0	1.47	6.0	10.8	10	β
1879.10	55.3	1.35	5.5	10.3	10	Cm
1888.99	53.0	1.60	6.0	10.5	20	F
1891.77	52.7	1.29	6.0	10.8	30	β
1891.93	52.6	1.32			40	F
1896.10	50.6	1.32			30	Sp
1898.12	49.0	1.80	6.2	11.5	20	A
1898.71	52.4	1.94	6.0	11.5	15	C2

Discovered with the 18½ inch. A fine object in a large aperture. Slow angular motion, with no

material change in the distance. ¹⁸⁹⁰⁻¹⁸⁹⁹ gives the proper motion of the principal star, $\alpha^1 \epsilon o 8$, in the direction of 212.5.

1879.02 55.3 1.35 5.5 10.3 10 Cm
1891.77 52.7 1.29 6.0 10.8 30 β
1891.93 52.6 1.32 40 F
1896.10 50.6 1.32 30 Sp
1898.12 49.0 1.80 6.2 11.5 20 A
1898.71 52.4 1.94 6.0 11.5 15 C2

 β 1043. *3rd Comae Berenices*

R.A. 2 00 28.7

Decl. 1 50 58.3

1888.02	2 02.1	1.00	5	10.0	30	β
1898.71	2 04.3	1.05			40	B4E

Discovered with the 30-inch. The primary star has a small proper motion of 0.020 in the direction of R.A. 140°40'. This movement 1888-90 would increase the angle 2.8 if the companion was fixed. It is very probable from the measures that the small star is moving with the other, but further observations are needed.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 185. Lalande 7735

R.A. $2^h 30^m 40^s$
Decl. $-2^{\circ} 30' 30''$

1874.10	215.4	1.00	8.0...	11.0	J
1875.10	215.4	3.13	8.0...	9.5	10 Cin
1878.10	231.8	2.45	8.0...	9.5	10 C 10
1888.10	216.7	3.03	8.0...	11.0	10 I
1898.10	236.4	3.09			10 Sec

Discovered with the 6-inch. Relatively fixed.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 88. Lalande 891

R.A. $2^h 27^m 40^s$
Decl. $-2^{\circ} 29' 30''$

1893.10	00.1	2.40	3.8	12.2	20 B
1898.12	89.6	1.00		10.2	20 B

Distant companion noted with the 6-inch. The proper motion of 51 *Eridani* is 0.081 in the direction of 151.2 (Auwers). The measures do not cover a sufficient time to show whether or not the small star has the same movement. It is probably only an optical pair.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 882. Lalande 8986

R.A. $2^h 27^m 40^s$
Decl. $-2^{\circ} 29' 30''$

1893.10	231.6	2.04	8.8...	10.0	16 B
1898.10	222.2	1.00	8.5...	9.8	16 B
1899.8.1	224.5	2.70	8.5...	10.5	16 B
1898.9.6	228.2	2.28	8.5...	9.7	16 B

Discovered with the 6-inch. The proper motion of 51 *Eridani* is 0.081 in the direction of 151.2 (Auwers). The measures do not cover a sufficient time to show whether or not the small star has the same movement. It is probably only an optical pair.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 1044. D.M. 1601637

R.A. $1^h 45^m 10^s$
Decl. $+10^{\circ} 47' 30''$

1888.11	218.5	1.03	9.0...	11.0	30 B
1898.11	220.2	8.03	9.0...	11.0	20 A

Discovered with the 36-inch. It is 3" 59" *f* 113 *apex*. The measures so far show no sensible change.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 1236 Lalande 8833

R.A. $1^h 45^m 27^s$
Decl. $+10^{\circ} 47' 30''$

A and B

1891.84	118.3	1.42	7.8...	10.8	30 B
---------	-------	------	--------	------	------

A and C

1891.84	314.1	40.24		8.5	30 B
1899.09	313.7	40.13		8.3	10 B
1899.11	313.9	40.53		8.5	10 A

Discovered with the 36-inch. A and C are respectively, O. Arg. S. 3268 and 3266.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 186. Lalande 8986

R.A. $2^h 27^m 40^s$
Decl. $-2^{\circ} 29' 30''$

1875.52	171.4	2.00	8.2...	11.0	30 J
1877.87	172.4	1.08	7.0...	9.0	10 Cin
1879.11	170.4	1.38	8.0...	9.5	10 Cin
1896.6.1	171.3	1.79	8.0...	9.5	20 Ix
1898.10	171.4	1.60	8.3...	10.0	20 I
1898.10	170.4	1.76	7.2...	9.0	10 M
1898.7.1	176.7	1.74	8.3...	8.8	10 B
1898.10	171.6	1.65	8.0...	9.5	10 B

Discovered with the 6-inch. Without change.

[Barnard (1890), *Ann. Obs. C. C.* ... Barnard (1890)...]

β 312. Lacatide 4205

R.A. $1^h 42^m 36^s$ t
Decl. $+21^\circ 1' A$

1870.06	343.8	3.13	8.5...	10.5	19	Hd
1876.01	345.1	3.24	7.7	9.0	39	Cin
1876.03	345.7	3.35	8.0...	9.5	29	HI
1877.52	343.6	3.29	8.0...	9.0	29	Cin
1888.15	345.8	3.26	8.0...	10.2	39	HI
1898.84	345.2	3.05	8.5...	10.0	19	C ₂
1898.88	344.5	3.43	7.7...	8.5	29	Bd

Discovered with the 6-inch. Relatively fixed. This had been previously seen at the Harvard Observatory, but not published until 1882.

[β (VI)... β (2062)...Cin?...Cin?...Hali...Hali...*found*
Harvard Coll. Obs., VIII...Boothroyd and Cogshall
(1882)...]

 β 551. α Tau²

R.A. $1^h 42^m 52^s$ t
Decl. $+15^\circ 42' A$

B and C

		"				
1878.09	205.7	6.26			19	β
1891.94	205.5	5.83	11.0	12.8	39	β
1898.72	205.0	6.21	11.0	13.5	29	β

A and B (H 3201)

1831	55.8	25	0	13	19	H
1878.09	57.2	30.75			19	β
1891.94	57.0	29.79	6		39	β
1898.72	56.4	29.37	6		29	β

The faint attendant to Herschel's companion was noted with the 18½-inch. There is another faint star in the group. The above are all the measures of AB. It is probably a perspective group only.

The proper motion of the principal star is small. It is given in the *Berlin A. G. Catalogue* as 0.008 in the direction of 43.9.

[β (X)... β (3311)...*found*...]

 β 883. Lacatide 4205

R.A. $1^h 42^m 52^s$ t
Decl. $+15^\circ 42' A$

A and B

1879.00	17.5	0.35	7.0...	7	19	β
1887.17	84.7	0.15			39	St
1888.09	124.4	0.18			29	St
1889.15	149.6	0.22			49	Sp
1890.14	203.4	0.16			35	Sp
1891.08		Single			79	Sp
1891.14		Single			29	β
1891.17	35.3	1.2	7.8	7.8	39	β
1894.66	350.3	0.19			39	Boothroyd
1895.74	6.4	0.39			2-19	See
1895.74	8.9				19	Boothroyd
1896.10	8.9	0.25			12.5	Sp
1896.88	16.9	0.28			35	A
1896.97	28.3	0.24			100	See
1897.00	25.3				100	Do
1897.13	23.8	0.27			39	Sp
1897.16	30.0	0.35			100	Moulton
1897.31	37.3	0.38			29	Lew
1897.72	30.2	0.25			29	Do
1897.76	32.7	0.21			39	Boothroyd
1897.78	37.0	0.31	7.8	7.8	29	See
1897.81	33.0	0.25			29	β
1897.83	31.5	0.28			66	A
1897.90	35.2	0.34			39	Lew
1897.90	34.7	0.39			19	Boothroyd
1897.90	34.7	0.39			29	Do
1897.95	34.8	0.27			39	Hu
1898.08	41.3	0.23			19	Do
1898.09	37.7	0.26			69	A
1898.09	41.5	0.26			39	Lew
1898.18	24.8	0.25			29	Sp
1898.69	43.9	0.28	6.5	6.5	39	A
1898.74	45.3	0.19			39	Boothroyd
1898.74	40.0	0.24			29	β
1898.75	51.4	0.30			19	Lew
1898.77	34.8	0.27			39	A

A, B and C

1879.00	148.8	18.38	...	1.1	19	0
1891.95	348.5	18.27	0.8...	1.13	19	β
1897.74	154.7	17.74	...	1.13	19	Boothroyd
1897.80	153.4	18.04			19	Lew
1897.98	153.7	17.77			19	Boothroyd
1898.17	154.5	17.85			19	A
1898.74	154.7	17.74			19	Boothroyd

This very remarkable and interesting binary system was discovered with the 18 $\frac{1}{2}$ -inch. The motion has been rapid, and apparently more than one revolution has already been passed over by the companion. As the components are sensibly equal in magnitude, there is, as in all cases of this kind where the angular motion is rapid and the early measures separated by considerable intervals of time, some uncertainty as to the proper quadrant to be given to some of the measured angles. It is always a difficult pair. The maximum distance probably does not exceed 0".25.

Two orbits have been computed for this pair, the first by GLEASNAPP, using the measures down to 1874.71, $\log i = 0.00$ 01 10 34 8000 (A. N. 1409), and the other by SEE from the measures to 1897.19, with a period of 5.5 years (*Mon. Not.* June 1897). To reach the last result, it was necessary to subject some of the measures to corrections of 180° in the angles, which seemed hardly warranted when the observations were considered as a whole. It also required the rejection of the three measures of 1891.07 with the 36-inch refractor. On the whole, from a careful consideration of all the measured positions made, it is practically certain that the period of five and one-half years is not correct, and, furthermore, that in consequence of the non-agreement of some of the measures with any apparent ellipse which can be selected, the real period, even approximately, cannot be known until the companion has moved over a larger arc, and particularly through the first quadrant. It has been well observed during the last two or three years, but even now (1899) the true form of the apparent orbit, for the reasons stated, is somewhat uncertain. It is probable that the period will not be far from that of GLEASNAPP, but the other elements may differ very widely.

This star, according to PORTER, has no sensible proper motion.

1874.95 1886.19 1892.06 1897.19 1900.00 1905.00 1910.00 1915.00 1920.00 1925.00 1930.00 1935.00 1940.00 1945.00 1950.00 1955.00 1960.00 1965.00 1970.00 1975.00 1980.00 1985.00 1990.00 1995.00 2000.00

See (1466)... Hussey (A. J. 427)... Atten (1465)
Vogel (A. J. 415, 420) (*Proc. A. S. P.* 15, 238)...
Barnard (A. J. 435)... Lewis and Bowyer (*Mon. Not.* 115,



β 552. *Orionis* 11. Lalande 6109

RA. 1 16 1 1
Dec. 1 18 27 3

1874.95	1	5	7	7	β
1886.19	265.0 ?	0.8 \pm	7	10	β
1892.06	Single			10	H Σ
1897.19	144.7	0.35 \pm		10	H Σ
1899.96	189	0.33	6.9	30	Sp
1900.00	189			20	Sp
1892.06	189			20	β
1897.19	189			10	Sp
1899.96	178.2	0.10		20	Sp
1900.00	177.0	0.10		20	Bar
1905.00	177.0			20	Sp

1896.84	1897.7	1.3	1%	H ₂
1896.88	1897.2	0.40	3%	A
1897.13	1898.5	1.5	2%	Sp
1897.82	1898.7	0.44	3%	A
1897.95	1898.4	0.43	3%	Hu
1898.01	1899.9	6.9	2	Lew
1898.12	1899.2	0.43	3%	A
1898.74	1899.1	0.45	3%	A

This pair was discovered with the 18 $\frac{1}{2}$ -inch in 1877, but in looking over the old observing book used with the 6-inch, I find that on December 14, 1874, this star was noted as "possibly a close pair," and the angle and distance estimated as given above. It seems to have received no further attention with the small telescope, and was discovered independently three years later with the large refractor of the Dearborn Observatory.

There seems to be something singular about the appearance and difficulty of this pair at times with large apertures. It was not noted as difficult at the

β 1337. *Antares* γ 143

$$\begin{array}{l} \text{R.A. } 4^{\text{h}} 20^{\text{m}} 28^{\text{s}} \\ \text{Decl. } -21^{\circ} 29' \end{array}$$

1891.81	58.0	2.2	8.0	8.0	20	β
1898.11	58.0	2.8	8.0	11.0	20	A

Discovered with the 36-inch. Evidently fixed.

$$\left[\begin{array}{l} \text{Collins (1891)... (1893)... (1906)... (1911)... (1920)... } \\ \text{Hussey (1911)... } \end{array} \right]$$

 β 310. *Antares* γ 123

$$\begin{array}{l} \text{R.A. } 7^{\text{h}} 52^{\text{m}} 20^{\text{s}} \\ \text{Decl. } 1^{\circ} 10' 3'' \end{array}$$

1877.11	170.2	1.00	8.0	6.5	20	H1
1876.00	170.8	1.10	8.1	7.2	10	J
1877.95	170.8		8.0	8.0	10	Cin
1878.11	170.8	1.16	8.0	7.0	10	Cin
1882.11	178.8	1.22	9.0	8.0	09	W
1880.04	176.9	1.31				I.M.
1887.00	179.4	1.31	8.0	8.0	10	I
1888.15	178.6	1.31	9.0	8.5	10	H1
1888.00	179.2	1.33	8.0	8.1	30	Lv
1895.00	178.5				10	Deb

Discovered with the 6-inch. There has been no change in twenty years. In β (vi) the R.A. is $10''$ too great. It is $10''$ of ω *Eridani*.

$$\left[\begin{array}{l} \text{Collins (1891)... (1911)... (1913)... (1914)... (1915)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

 β 313. *Antares* γ 123

$$\begin{array}{l} \text{R.A. } 7^{\text{h}} 52^{\text{m}} 20^{\text{s}} \\ \text{Decl. } 1^{\circ} 10' 3'' \end{array}$$

$$\left[\begin{array}{l} \text{Collins (1891)... (1911)... (1913)... (1914)... (1915)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

The 6-inch seemed to show a small attendant to this star, the position of which was estimated as given above, with the note, "Companion excessively faint. There is a more distant one $3\frac{1}{2}''$." There are no other observations except of a negative character. I could not find any pair of this kind in or near this place with the 36 inch. It was recently examined with the 40-inch (1898), but no near companion seen. This star has two distant companions. The original record throws no light

on the question. There is no apparent error in the place. The magnitude in D.M. is 7.0.

$$\left[\begin{array}{l} \text{Collins (1891)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

 β 553. α *Orionis*

$$\begin{array}{l} \text{R.A. } 4^{\text{h}} 40^{\text{m}} 37^{\text{s}} \\ \text{Decl. } -12^{\circ} 19' 3'' \end{array}$$

1877.86	47.7	28.88	5	1.2	20	β
1892.01	48.4	29.07	5.0	1.3	30	β
1898.75	49.1	30.57	5	12.5	20	β

Discovered with the 18 $\frac{1}{2}$ -inch. The proper motion of the principal star is 0.097 in the direction of 231.9 (AUWERS). This accounts for the change shown in the measures, and it is therefore only an optical pair.

$$\left[\begin{array}{l} \text{Collins (1891)... (1911)... (1913)... (1914)... (1915)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

 β 404. D.M. (8 $^{\circ}$) 805

$$\begin{array}{l} \text{R.A. } 3^{\text{h}} 19^{\text{m}} 50^{\text{s}} \\ \text{Decl. } 3^{\circ} 58' 58'' \end{array}$$

1877.11	111.8	1.50	9.1	9.8	10	J
1888.69	291.6	1.52	8.8	8.9	30	Lv
1891.82	119.6	1.94	8.5	8.5	20	C
1898.72	111.4	1.72			20	H1

Discovered with the 6-inch. Without motion.

$$\left[\begin{array}{l} \text{Collins (1891)... (1911)... (1913)... (1914)... (1915)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

 β 1045. α *Tauri*

$$\begin{array}{l} \text{R.A. } 3^{\text{h}} 56^{\text{m}} 32^{\text{s}} \\ \text{Decl. } 5^{\circ} 25' 3'' \end{array}$$

1889.09	6.2	6.30	6	12.3	30	β
1891.84	5.6	6.21	6	13.3	30	β
1898.96	6.1	6.19		13.7	10	β

Discovered with the 36-inch. AUWERS gives this star a small proper motion, 0.021 in the direction of 238.4. Further measures are necessary to show whether or not the companion has this movement.

$$\left[\begin{array}{l} \text{Collins (1891)... (1911)... (1913)... (1914)... (1915)... } \\ \text{...LM...Lv...Tarrant (1899)... Hall (1, 11)... Dobersch } \\ \text{(1878)... } \end{array} \right]$$

β 554. ϵ Auriga

R.A. $4^{\text{h}} 58^{\text{m}} 22^{\text{s}} .6$
Decl. $+13^{\circ} 30' 3''$

A and B

1878.89	224.5	29.31	3.2	1.4	1 μ	β
1891.86	224.8	29.30		1.3 \pm	2 μ	β
1898.79	223.8	29.03		1.3.3	1 μ	β

A and C

1878.42	275.4	42.88		1.2	1 μ	β
1878.97	275.3	42.01		1.1.7	1 μ	β
1891.86	275.0	43.03		1.1.7	2 μ	β
1898.79	275.0	43.03		1.1.8	1 μ	β

A and D

1878.80	317.9	...	...	1.3	1 μ	β
1879.47	317.1	46.37	...	1.2	2 μ	β
1891.86	317.0	46.29	...	1.2.6	2 μ	β
1898.79	317.3	46.21		1.3.0	1 μ	β

These minute stars were noted with the 18 $\frac{1}{2}$ -inch. The proper motion is very small, 0.022 in the direction of 231.71 (BONN). The same catalogue gives the principal star as variable, 3.0 to 4.5 m. BALL in his parallax measures (*Dunsk Obs.* IV) used a star 207.6 distant in the angle of 47.3.

[β (VI)... β (393114)... β (266.7...0.000...)]

 β 314. δ Leporis

R.A. $4^{\text{h}} 53^{\text{m}} 36^{\text{s}} .6$
Decl. $+10^{\circ} 34' 3''$

A and B

1876.69	140.0	0.43	6.6...	0.9	4 μ	J
1879.10	139.7		6.0...	...	1 μ	Cm
1879.78	133.0	0.5 \pm			1 μ	Cm
1889.13	126.9	1.05	6.5...	...	3 μ	β
1890.40	121.6	0.82			2 μ	NP
1898.11	126.2	0.86	7.0...	...	...	Br
1898.16	120.2	0.98			1 μ	Sec

A and C

1889.13	29.0	54.45		...	...	β
1898.16	30.6	54.33		...	...	Sec
1899.09	31.1	54.38		...	...	β

Discovered with the 6-inch. In HEIS and ARGILLANDER 6 m, but placed in *Eridanus*. GOULD gives it in *Lepus* 6 m. LALANDE 9420. In all but one measure J rates the components of equal magnitude. The change, if any, is in the distance. At the time of discovery the distance was estimated 0.5.

[β (VI)... β (393114)... β (266.7...0.000...)]
Cin β ...Sp (III)...See ()...Brown ()...

 β 1238. δ Eridani

R.A. $7^{\text{h}} 53^{\text{m}} 50^{\text{s}} .6$
Decl. $+20^{\circ} 21' 3''$

1891.82	12.6	1.42	8.1	11.3	3 μ	β
1899.11	7.2	1.57	7.2	11.3	1 μ	A

Discovered with the 36-inch. It is 25" ρ and 9's of the wide pair, SOUTH 461.

[β (XVII)... β (31313)... β (266.7...0.000...)]

 β 315. α Aia N. 2402

R.A. $4^{\text{h}} 53^{\text{m}} 54^{\text{s}} .6$
Decl. $+20^{\circ} 22' 3''$

1877.35	226.0	10.45	6.0	13.8	2 μ	J
1891.86	226.0	10.67	8.7	13.8	2 μ	β

Discovered with the 6-inch. Unchanged.

[β (VI)... β (2662,3114)... β (Pub. L. O. 10)...J (1)...]

 β 1046. γ Auriga

R.A. $4^{\text{h}} 57^{\text{m}} 17^{\text{s}} .6$
Decl. $+20^{\circ} 20' 3''$

A and B

1888.02	93.8	6.20	5.5	12.7	3 μ	β
1898.79	92.0	6.38		12.7	1 μ	β

A and C (= H γ VI. 33)

1783.3	62.2	70.83			1 μ	Li
1888.16	61.0	70.83	8.1	12.1	2 μ	2 μ
1888.97	60.8	70.03		12.1	2 μ	β
1898.79	60.9	70.23		12.1	1 μ	β

The faint star, B, was detected with the 6-inch. The principal pair, according to A. MANN, has a proper motion of 0.166 in the direction of 100.5.

When this magnitude was first determined in 1855, as the result of observations made with the 6-inch, it should have been 70.8 ± 70.8 . All the measures of AC are given above. It is practically certain that the new star is moving with A, as otherwise the position-angle would be 14° less in 1898 than at the date of the first measures.

(1855) β 884. β 884 (Lalande 884) ... β 884 (Lalande 884) ...

β 884. Lalande 884

β 884 = 70.8 ± 70.8

1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	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β 885. Lalande 9758

R.A.		Dec.		Name		Type	
h	m	°	'	h	m	°	'
1850.80	1909.1	8.3...	8.4	39	3		
1858.92	1909.7	8.0...	8.6	29	LV		
1862.13	186.5	8.0...	9.0	19	C		
1868.11	1910.8			19	III		

Discovered with the 18½-inch. Probably unchanged.

[*β* CMH...*β*¹...Collins (1925)...*H. v. v. v.*
Coll. Obsy. 1892)...Brown ()...]

β 1006. S.D. 12. 116.

	R.A.	δ	P°	I'	t					
	Decl.		2°	$24' V$						
A and B										
1882.00	201.7	0.78	9.6..	11.0	$2R$	β				
1891.93	203.5	0.66	8.5..	9.0	$2R$	β				
A and C										
1882.00	177.8	52.20		9.7	$2R$	β				
1891.93	178.2	52.40		8.7	$2R$	β				
1890.00	177.8	52.37		8.9	$2R$	β				

Discovered with the 12 inch on Mt. Hamilton
in 1881.

[β EXHIB., β ., β EXHIB., β Pq., β Pq.]

β 555. β *Orionis*

β 318. *Isotria medeolae*

Decl. — 33° 35' 0"

1870.23	227.2	1.00	8.3...	8.7	20	J
1878.61	226.6		8.2...	8.5	20	Cin
1883.13	226.2	0.54	8.5...	8.7	10	Sp
1886.11	227.3	0.48	8.0...	8.0	10	I M
1890.11	238.5	0.57			10	Br
1898.78	234.2	0.64	8.0...	8.0	20	A
1898.93	229.9	0.78	8.5...	8.5	20	C

Discovered with the 6-inch. There seems to be no sensible change.

[3] ... Aitken () ... Cogshall () ...]

β 188. τ *Orionis*

R.A. 2 17 57
Decl. 1 28 5

B and C

1876.22	49.1	3.77	11	12	20	11
1878.26	52.8	4.17	13	13	44	3
1891.64	51.4	3.79	14	14	36	3

A 624 B 6 = H¹ V, 231

1882	250.4	18	1	14	17	H
1865.08	248.3	21.28			19	Hd
1876.22	250.1	36.11		11	20	Hd
1877.95	249.1	37.2			19	B
1891.94	249.2	35.24			18	B
1890.02	250.3	35.40			19	B

1830	60.8	35.09	100	11
1868.08	60.8	35.09	100	11
1876.22	59.8	35.09	100	11
1877.95	60.0	36.09	100	11
1891.94	60.0	35.07	100	11
1890.02	60.0	36.02	100	11

The attendant to the H¹ companion was discovered with the 18½-inch. H¹ failed to see D, which was added by H² (*Fifth Catalogue*). The above are all the measures of these stars.

AUWERS gives the proper motion of the principal star 0.035 in the direction of 290° .

[illegible]

β 886. *Enallagma cyathigerum* (L.)

R.A. 5^h 11^m 21^s
Dec. - 31° 41'

C and D

1832.22	246.9	0.90	8.5...10.0	17	β
1832.07	253.8	0.77			β
1832.11	255.2	0.72			β

$$A \text{ and } B \rightarrow \frac{A \rightarrow B}{A \rightarrow B}$$

1829.24	67.6	17.17	8.2..	9.0	Σ
1844.26	68.6	17.17	8.2..	9.0	M
1867.22	68.7	17.17	8.0..	9.0	J
1882.23	68.5	17.51	8.2..	8.6	β
1892.06	67.9	17.17	8.1..	8.6	β
1898.19	68.9	17.17	8.1..	8.6	β

A and C (≥ 1)

1820.24	153.5	18.75	1.1	2
1867.22	142.0	18.75	3.0	4
1882.24	131.2	48.48	5.5	5
1892.06	153.0	10.42	6.0	6

The duplicity of the distant Σ companion was discovered with the 18.1-inch. There is no change in the wide triple. The above are all the measures of AB and AC. The measures indicate that the

β 887. (33)

β 556. Lalande 13179

R.A. $\epsilon^h 18^m 30^s$
Decl. $-23^{\circ} 36'$

1878.17	242.2	7.76	7 ... 12	29	β
1891.85	239.2	0.89	7.0 ... 11.3	39	β
1898.76	238.0	1.18	7.0 ... 10.5	19	β

Discovered with the 18½-inch. It is a bright star near η *Orionis*, and wanting in many of the star catalogues. In Lalande and S.D. 8 m.

[β (X...), β , β , β (111), β (Pub. L. O. n)...]

β 889. W. V. 518

R.A. $\epsilon^h 26^m 16^s$
Decl. $+34^{\circ} 19'$

A and B

1878.91	223.5	1.11	8.5 ... 10.0	19	β
1891.95	223.7	0.80	8.4 ... 8.8	39	β
1898.86	229.1	0.85	8.3 ... 9.0	19	β
1898.87	227.4	1.04	...	29	Bar

A and C

1891.95	102.6	3.76	...	14.1	39 β
1898.85	108.0	4.09	...	19	Bar

A and D

1891.95	108.0	12.04	...	13.8	39 β
1898.86	105.3	11.05	...	13.5	19 β

A and E (= Σ 707)

1830.75	131.0	18.29	8.0 ... 10.2	29	Σ
1844.26	134.7	17.61	...	19	Ma
1873.17	131.0	18.22	8.5 ... 10.0	29	J
1878.91	131.4	18.04	...	19	β
1891.95	133.3	18.22	...	39	β
1898.86	132.0	18.26	...	19	β

A and F

1878.91	209.7	27.77	...	11.5	19 β
1891.90	200.2	27.85	...	10.1	29 β
1898.86	200.3	27.84	...	11.0	19 β

The duplicity of the principal star of Σ 707 was discovered with the 18½-inch, and the very faint companions, C and D, added with the 36-inch. The Σ components are fixed. The above are all the measures.

[β (X...), β , β (111), β (Pub. L. O. n)..., Barnard (...), J (1079)..., D (10)..., Meiller (*Revue Scient. France* (1890))]

β 890. Lalande 13175

R.A. $\epsilon^h 26^m 36^s$
Decl. $+37^{\circ} 31'$

1882.14	280.0	1.17	8.4 ... 8.8	29	β
1891.89	282.3	1.08	8.6 ... 8.7	29	β

Discovered with the 18½-inch. Thus far there is no evidence of motion.

[β (X...), β , β (111), β (Pub. L. O. n)...]

β 319. O. Arg. S. 3957

R.A. $\epsilon^h 21^m 18^s$
Decl. $-23^{\circ} 29'$

1876.09	231.3	3.98	8.0 ... 10.1	39	HI
1877.11	228.1	3.89	7.7 ... 10.0	29	HI
1879.13	226.6	3.72	7.8 ... 11.5	19	β
1891.06	229.7	1.20	...	29	HI
1898.14	227.7	4.26	...	19	See

Discovered with the 6-inch. It is near β *Leporis*. The change, if any, is small.

[β (X...), β (2002), β , β (111), β (Pub. L. O. n)...]

β 891. W. V. 713

R.A. $\epsilon^h 22^m 28^s$
Decl. $+18^{\circ} 16'$

A and B

1879.10	121.6	9.86	7.0 ... 11.8	19	β
1891.98	126.7	10.60	8.0 ... 12.3	29	β
1898.85	122.2	10.60	7.5 ... 12.7	29	β

A and C (= Σ 777)

1873.31	20.6	32.83	7.2 ... 7.5	39	J
1879.03	22.0	32.82	7.5 ... 7.8	29	β
1891.07	20.6	33.40	8.0 ... 8.3	29	β
1892.20	21.0	33.25	7.4 ... 7.8	49	J
1898.15	20.7	33.34	7.6 ... 8.0	29	β

The second star was detected with the 18½-inch. It has no measure of AC. The wide pair is also O Σ (App) 64. The foregoing are all the measures. C is W. V. 713. The distance between A and C is slowly increasing. The resolution condition for 1892 marks the distance = 3.0 = 31.03 at 1892.

[β (X...), β , β (111), β (Pub. L. O. n)..., J (1079)..., Franz (1364)...]

β 1239. D.M. (34) 1074R.A. $5^h 23^m 28^s$
Decl. $+34^\circ 11'$

B and D

1891.77 324.6 2.31 ... 15.2 2H β

A and B (= H 367)

1873.77 239.2 7.1 ... 1H Rosse

1891.77 233.8 8.00 9.5... 9.9 3H β

1899.11 232.3 8.18 9.5... 10.5 1H A

A and C (= H 367)

1873.77 310.5 9.7 ... 1H Rosse

1891.77 310.1 10.53 ... 11.2 3H β

1899.11 308.5 9.88 ... 11.0 1H A

HERSCHEL'S description of the wide triple is: "One of the most curious objects in the heavens. It is a triple star forming an equilateral triangle, and placed exactly in the center of a small circular nebula, which extends a little beyond the stars on all sides, surrounding them like an atmosphere." The second star of this triangle, in order of magnitude, was found to be double with the 36-inch. The small star is extremely faint. The only previous measures of the HERSCHEL stars which I have been able to find were made with one of the reflectors of Lord Rosse's Observatory. They are evidently only approximate, and no change can be inferred from the differences in distance. The 36-inch shows another faint star 14 m, 13'.6 from A in the direction of 182°. AITKEN, 1678: 14'.76 (1899.11) 1H.

[β (XVIII)...β (*Mon. Not.* 101, 454)...β (3441)...β (*Pub. L. O.* 11, pp. 178, 224)...]

β 558. δ OrionisR.A. $5^h 25^m 52^s$
Decl. $0^\circ 23' N$

A and B

1878.46 226.9 33.27 200 13.8 4H β

1892.06 226.8 32.40 ... 11 3H β

1898.84 226.5 32.35 ... 13.7 2H β

A and C (= H' V. 10)

1781.90 358.2 52.97 ... 1H H

1835.75 359.2 52.74 ... 6.8 5H Σ

1863.05 359.2 52.48 ... 5H Eri

1870.05 359.3 52.49 ... 6.7 5H J

1879.08 360.3 52.62 ... 2H β

1898.84 359.3 52.50 ... 2H β

The faint companion was detected with the 18½-inch. The proper motion of δ *Orionis* is 0'.022 in the direction of 288°.4 (AUWERS). With this value, and the position of C from the measures of Σ, that companion, if fixed in space, should be in 1898.8, 360°.6 : 52'.3. As a wide pair this is H' V. 10 = Sh 60 = Σ 14 App I.

[β (XI)...β...β (3441)...β (*Pub. L. O.* 11, 201)
(*Radtcliffe Obs.* Vols. 23, 31, 38, 39)...Secchi (*Cat. di Stelle Doppie*)...*Fine A Search of Messier's Clouds*...*Rome*, 1855)...Engelmann (*Mon. Not.* 101, 454)...*Greenwich Catalogue*, 1865)...Jedrzejewicz (329)...Glaspenn (11)...]

β 1048. Lalande 10437R.A. $5^h 26^m 37^s$
Decl. $-1^\circ 41' N$

1889.13 358.2 2.20 6.2... 10.7 3H β

1898.20 354.6 2.22 6.0... 10.8 3H A

Discovered with the 36-inch. A naked-eye star in *Orion*; 6 m in D.M. and HEIS; GOULD, 6½. No proper motion in *Greenwich 10-Year Catalogue*.

[β (XV)...β (2929)...β (*Pub. L. O.* 11)...Aitken ()...]

β 1049. W' V. 651R.A. $5^h 27^m 37^s$
Decl. $-1^\circ 48' N$

C and D

1888.01 200.1 0.76 8.7... 0.7 2H β

1892.2 207.7 0.73 ... 2H F

1894.10 207.2 0.8 ... 2H Sp

1895.11 207.8 0.6 ... 4H Sp

1898.88 204.2 0.58 9.0... 0.7 1H β

A and B: $\Sigma 734$

1872.3	33.4	1.58	7.0...	8.6	3m	Σ
1872.20	33.7	1.61	...	...	1m	Ma
1867.76	33.8	1.5	7.0...	8.5	3m	J
1872.02	355.3	1.45	8.5...	...	1m	Hd
1872.02	35.3	1.73	8.0...	9.3	1m	β
1880.03	35.3	1.82	7.0...	8.5	1m	W
1880.02	35.3	1.83	6.5...	8.0	1m	LM
1888.72	35.3	1.95	7.1...	9.2	2m	Lv
1888.91	35.3	1.91	7.0...	8.0	4m	β
1890.20	35.3	1.92	...	...	2m	T
1890.80	35.3	1.94	...	...	5m	Sp
1892.02	35.3	1.64	7.2...	8.5	2m	J
1897.31	35.3	1.50	...	...	4m	Sp

A and C: $H^+ V. 119$

1783.76	248.4	30.20	..	1m	H ⁺
1832.43	243.1	29.20	.. 8.6	6m	Σ
1843.00	243.6	27.13	..	1m	Ma
1867.76	242.0	29.36	.. 8.6	3m	J
1872.02	245.0	30.11	..	1m	Hd
1879.02	242.8	29.47	.. 8.7	2m	β
1881.91	242.8	29.42	..	3m	β
1891.13	243.5	29.24	..	2m	Sp
1894.16	243.2	29.25	..	2m	Sp

The duplicity of C was discovered with the 36-inch. The change is not very pronounced. In appearance it is an interesting quadruple, but there has been no change of the Herschel and Struve companions with respect to A. All the measures of these stars are given above.

β 1267. ... β (Pub. L. O. II)... Sp (III)...
 (II)... (1872, 1891)... Motion (Finsen System)... J
 (II)... LM... Lv... Wilson (Cin...)... *Annals Harvard Coll. Obs.* XIII... Jones (*Proc. Haverford Coll. Obs.* 1892)...]

 β 1267. ... 18423

1872.3	217.9	30.74	...	...	3m	β
1892.16	218.3	30.72	...	...	2m	Sp
1896.01	217.4	30.66	...	...	4m	Sp

Discovered with the 36-inch in the course of measures of *Nova Aurigae*. The measures appear to indicate some retrograde motion. The magnitude in D.M. is 8.0.

[β (XIX)... β (3141)... β (Pub. L. O. II)... Sp (III)...]

 β 13. ... $V^+ V. 676$

R.A. 5^h 28^m 36^s l
 Decl. + 34° 34' V

1870.08	128.8	1.38	8.0...	10.0	2m	J
1879.10	131.7	1.01	8.0...	10.0	1m	Cin
1892.00	131.6	1.10	8.3...	8.6	3m	β

Discovered with the 6-inch. In a low-power field with Σ 743. No sensible change.

[β (II)... β (Mon. Not. XXXII, 351)... β (3114)... β (Pub. L. O. II)... Cin^5 ...]

 β 1050. Bond 974

R.A. 5^h 30^m 55^s l
 Decl. + 5° 33' V

1889.03	283.6	0.67	10.5...	11.7	3m	β
1898.94	283.6	0.65	10	...	1m	A

A difficult pair of small stars in the nebula of *Orion*, 1^m 32' f of θ^1 *Orionis*, and 5' s . Discovered with the 36-inch. It is No. 974 of BOND's catalogue of stars in the great nebula.

[β (XV)... β (2929)... β (Pub. L. O. II)... Aitken ()...]

 β 1240. 26 *Aurigae*

R.A. 5^h 30^m 50^s l
 Decl. + 36° 25' V

A and B

1892.00	344.4	6.15	5.6...	6.0	3m	β
1892.84	354.2	0.22	...	...	3m	Bar
1893.22	342.9	0.15	...	...	1m	Sp
1893.94	342.5	0.16	...	...	1m	Bar
1894.17	347.2	0.20 \pm	...	...	4m	Sp
1896.13	345.8	0.20 \pm	...	...	9m	Sp

β 1032. σ (Gamma)

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1860.80	355.7	0.23	40	β
1860.81	355.7	0.23	40	β
1860.82	355.7	0.23	40	β
1860.83	355.7	0.23	40	β
1860.84	355.7	0.23	40	β
1860.85	355.7	0.23	40	β
1860.86	355.7	0.23	40	β
1860.87	355.7	0.23	40	β
1860.88	355.7	0.23	40	β
1860.89	355.7	0.23	40	β
1860.90	355.7	0.23	40	β
1860.91	355.7	0.23	40	β
1860.92	355.7	0.23	40	β
1860.93	355.7	0.23	40	β
1860.94	355.7	0.23	40	β
1860.95	355.7	0.23	40	β
1860.96	355.7	0.23	40	β
1860.97	355.7	0.23	40	β
1860.98	355.7	0.23	40	β
1860.99	355.7	0.23	40	β
1861.00	355.7	0.23	40	β

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1860.97	355.4	0.23	40	β
1860.98	355.4	0.23	40	β
1860.99	355.4	0.23	40	β
1861.00	355.4	0.23	40	β
1861.01	355.4	0.23	40	β
1861.02	355.4	0.23	40	β
1861.03	355.4	0.23	40	β
1861.04	355.4	0.23	40	β
1861.05	355.4	0.23	40	β
1861.06	355.4	0.23	40	β
1861.07	355.4	0.23	40	β
1861.08	355.4	0.23	40	β
1861.09	355.4	0.23	40	β
1861.10	355.4	0.23	40	β
1861.11	355.4	0.23	40	β
1861.12	355.4	0.23	40	β
1861.13	355.4	0.23	40	β
1861.14	355.4	0.23	40	β
1861.15	355.4	0.23	40	β
1861.16	355.4	0.23	40	β
1861.17	355.4	0.23	40	β
1861.18	355.4	0.23	40	β
1861.19	355.4	0.23	40	β
1861.20	355.4	0.23	40	β

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1860.97	355.4	0.23	40	β
1860.98	355.4	0.23	40	β
1860.99	355.4	0.23	40	β
1861.00	355.4	0.23	40	β
1861.01	355.4	0.23	40	β
1861.02	355.4	0.23	40	β
1861.03	355.4	0.23	40	β
1861.04	355.4	0.23	40	β
1861.05	355.4	0.23	40	β
1861.06	355.4	0.23	40	β
1861.07	355.4	0.23	40	β
1861.08	355.4	0.23	40	β
1861.09	355.4	0.23	40	β
1861.10	355.4	0.23	40	β
1861.11	355.4	0.23	40	β
1861.12	355.4	0.23	40	β
1861.13	355.4	0.23	40	β
1861.14	355.4	0.23	40	β
1861.15	355.4	0.23	40	β
1861.16	355.4	0.23	40	β
1861.17	355.4	0.23	40	β
1861.18	355.4	0.23	40	β
1861.19	355.4	0.23	40	β
1861.20	355.4	0.23	40	β

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1860.97	355.4	0.23	40	β
1860.98	355.4	0.23	40	β
1860.99	355.4	0.23	40	β
1861.00	355.4	0.23	40	β
1861.01	355.4	0.23	40	β
1861.02	355.4	0.23	40	β
1861.03	355.4	0.23	40	β
1861.04	355.4	0.23	40	β
1861.05	355.4	0.23	40	β
1861.06	355.4	0.23	40	β
1861.07	355.4	0.23	40	β
1861.08	355.4	0.23	40	β
1861.09	355.4	0.23	40	β
1861.10	355.4	0.23	40	β
1861.11	355.4	0.23	40	β
1861.12	355.4	0.23	40	β
1861.13	355.4	0.23	40	β
1861.14	355.4	0.23	40	β
1861.15	355.4	0.23	40	β
1861.16	355.4	0.23	40	β
1861.17	355.4	0.23	40	β
1861.18	355.4	0.23	40	β
1861.19	355.4	0.23	40	β
1861.20	355.4	0.23	40	β

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1860.97	355.4	0.23	40	β
1860.98	355.4	0.23	40	β
1860.99	355.4	0.23	40	β
1861.00	355.4	0.23	40	β
1861.01	355.4	0.23	40	β
1861.02	355.4	0.23	40	β
1861.03	355.4	0.23	40	β
1861.04	355.4	0.23	40	β
1861.05	355.4	0.23	40	β
1861.06	355.4	0.23	40	β
1861.07	355.4	0.23	40	β
1861.08	355.4	0.23	40	β
1861.09	355.4	0.23	40	β
1861.10	355.4	0.23	40	β
1861.11	355.4	0.23	40	β
1861.12	355.4	0.23	40	β
1861.13	355.4	0.23	40	β
1861.14	355.4	0.23	40	β
1861.15	355.4	0.23	40	β
1861.16	355.4	0.23	40	β
1861.17	355.4	0.23	40	β
1861.18	355.4	0.23	40	β
1861.19	355.4	0.23	40	β
1861.20	355.4	0.23	40	β

The close pair was discovered with the 12-inch. It is certain to be a binary, and the measures already made indicate retrograde motion. The maximum distance probably does not exceed $0''.25$; otherwise I would have found it before. AUWERS gives the principal star a proper motion of $0''.024$ in the direction of $297^\circ.7$. It is evident that both stars have the same movement.

There is no relative change in the distant stars ($= H^1 II. 10 = Sh. 63 = \Sigma 762$), and they must therefore have the same proper motion as σ . An annual movement of even $0''.02$ in the time covered by the measures would be apparent if either of these companions was fixed in space. With this proper motion, and the positions of Σ for the distant companions, at this time (1899.1) they should be:

ΔC	228.7	10.33
ΔD	88.0	14.24

[β (XIV)... β (2875,3048,3114)... β (Pub. L. O. II)... β (III)...Aitken ()...]

The following relate to the old companions:

[Mader (*Zeitschr. f. Astr.*)...*Verh. d. Astr. Ges.* XI, XII, XVI...Herschel (*Cape Obs.*)...Dawes (*Mem. R. A. S.* VIII (*Obs.* at Bishop's Obs.)...Radtke (*Obs.* XXIII, XLVI...Jacob (*Mem. R. A. S.* XVI)...An. *Königsberg Sternwarte*, München XVII...*Annals Harvard Obs.* XIII...Engelmann (*Mon. Neunzig Doppelsternen*)...Wilson and Seabroke (*Mem. R. A. S.* XLIII)...Nobile (*Rend. Acad. Sci. Napoli*, Jan. 1875)...Webb (*Mon. Not.* XX, 253)...Dawes (*Mem. Not.* XX, 285)...J (II)...Cin⁵...Gaudibert (*Soc. Sci. France Bul.* 1890)...Hall (II)...Hahn (*Mikrom. Ver. des Sternhauens* $\Sigma 762$, Leipzig, 1891)...Glaserapp (II)...Solá (3529)...]

 β 321. *Lafayette 45*

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1877.11	142.1	1.06	7.0...	8.0	10	Cin
1877.33	144.5	0.68	6.8...	8.3	30	J
1879.48	139.2	0.99	6.9...	7.3	30	β
1888.92	144.2	0.76	7.1...	8.4	20	Lv
1891.15	145.4	0.6±	...	...	20	Sp
1896.20	153.9	0.55	...	...	10	Sp
1898.16	143.1	0.81	...	...	10	See

$\frac{1}{2} \text{ inch } = 100''$
 $\frac{1}{2} \text{ inch } = 100''$

1877.11	358.0	1.56	8.0...	8.5	10	Cin
1877.34	357.5	1.26	9.3...	9.7	30	J
1879.48	359.4	1.19	9.0...	9.8	30	β
1888.94	358.3	1.40	8.5...	9.0	20	Lv
1898.16	359.7	1.11	...	...	10	See

AB and C

1876.59	136.0	89.49	...	9.0	2n	J
1879.18	136.0	88.41	...	...	3n	B
1893.16	135.8	89.30	6.6...	8.4	3n	Gl
1898.16	136.6	89.29	...	...	1n	See

AB and E

1876.59	6.2	76.20	7.0 . . . 8.0	2 ⁿ	J
1893.16	6.3	76.23	6.6 . . . 7.5	2 ⁿ	Gl

AB and F

1876.59 298.5 126.46 ... 8.5 22 J

AB and G

1878.17 48.7 60.3 ... 10 in β

AB and H

1878.17	310.4	41.79	... 13	1n β
1898.16	306.2	40.96	...	1n See

The five principal stars of this group were observed by HERSCHEL (*Cape Observations*), and entered as H 3780, with the description "Quintuple, 6th and 7th classes, magnitudes 7, 7, 8, 8, 8." With the 6-inch I found that two of these stars were close doubles, and noted two more faint stars in the group. The four bright stars, A, E, C, and F, are, respectively, 10726, 10727, 10728, and 10725 of LALANDE. The group is just visible to the naked eye as a 6 m star.

The measures give no certain evidence of motion in the close pairs.

[β (v1)... β (2062)... β^1 ... β^3 ...d (11)...Cin⁴...Lv¹...Knott
(Observatory IV, 184,212)...Sp (III)...Glasenapp (II)...
See ()...]

β 1007. 125 *Tauri*

		R.A.	5 ^h 31 ^m 22 ^s	
		Decl.	+16° 28' 5"	
1881.86	266.2	0.27	6.0.	6.2
1887.16	249.5	—	—	—
1888.07	241.7	0.2 ±	—	—
1889.10	239.5	—	—	—
1890.78	—	—	—	—
1891.79	—	—	—	—
1892.06	—	—	—	—

1894.16	243.6	0.22	2H	Sp
1896.15	230.8	0.26	3H	Sp
1897.13	226.9	0.26	2H	Sp
1897.51	245.1	0.30	1H	β
1898.20	227.2	0.26	1H	Sp
1899.17	244.5	0.18	1H	A

Discovered with the 12-inch on Mt. Hamilton in 1881. It was single or too close for the 36-inch 1890-92. The measures since then show but little change in the angle, but a whole revolution may be covered by the observations. The components are nearly equal, and therefore some of the measures may require a correction of 180° . In my measure with the 40-inch in 1897 it was noted: "The distance is less than 0.3 ; the smaller star is ρ ." In the first set of measures in 1881 with the 12-inch it was stated: "The measured distances are decidedly too large." The distance is probably always less than 0.25 . There is little doubt of its being a binary of short period.

The proper motion is small, 0.013 in the direction of 173.7 (AUWERS).

[β (XIII)... β ... β (3048,3049)... β (*Pu* I, c. 11)... β (c. 3)
...Aitken ()...]

β 322. O. Arg. S. 4178

	R.A.	5	34	40	1	
	Decl	-25	13	3		
1877.11	104.2	2.23	8.2	9.5	1 ^m	Cin
1808.14	103.4	2.76			1 ^m	See
1808.83	103.0	2.87	8.0...	9.0	1 ^m	Id

Discovered with the 6-inch.

[β (v1)... β (2062)...Cin⁴...See ()...Boothroyd ()...]

β 14. *Halimolobos*

	RA	δ^h	$\delta^h - \delta^N$	
	1995	2000	1997	
1870.432	1.004.8	5.7.8		100% Σ
1870.443	1.003.7	5.7.4	7.4	100% Σ
1891.000	1.004.8	8.7.0	7.1	100% Σ

Discovered with the colon. Unobridged

$$\begin{aligned} \beta(0) &= \beta(\text{Mon}, \text{Nuc}, \text{Chem}, \text{Sci}) = \beta(\text{Sci14}) = \beta(\text{Pub1}) \\ \beta(0) &= \text{OS}(P_{\text{Sci}} - \text{Mon}, \text{Nuc}, \text{Sci}), \quad \beta(0) = 1 \end{aligned}$$

β 92. W² V. 1309

R.A. 5^h 49^m 57^s *t*
Decl. +21° 4' *t*

1875.45	170.2	8.87	9.3...11.0	2 <i>n</i>	J
1890.15	171.7	8.59	...	3 <i>n</i>	T
1892.03	169.9	9.24	8.6...9.6	2 <i>n</i>	β
1892.16	170.3	9.12	...	2 <i>n</i>	T

Discovered with the 6-inch. Relatively fixed.

[β (ii)... β (*Mon. Not. XXXIII*, 437)... β (3141)... β (*Pub. L. O. II*)... β (i)...Tarrant (3186)...]

 β 561. Lalande 10969

R.A. 5^h 41^m 18^s *t*
Decl. +12° 23' *t*

1878.09	4.0	19.70	7...13	1 <i>n</i>	β
1892.00	3.4	19.47	7...12.2	3 <i>n</i>	β

Noted with the 18½-inch in looking for H 5465.

[β (X)... β ... β (3114)... β (*Pub. L. O. II*)...]

 β 560. Lalande 10958

R.A. 5^h 41^m 37^s *t*
Decl. +20° 41' *t*

1877.88	208.2	0.94	8.0...8.0	1 <i>n</i>	β
1889.66	178.2	0.6±	...	2 <i>n</i>	Sp
1891.15	174.0	0.58	...	4 <i>n</i>	Sp
1892.10	172.4	0.60	8.0...8.8	4 <i>n</i>	β
1895.06	155.3	0.52	...	1 <i>n</i>	Lew
1898.12	167.5	...	...	1 <i>n</i>	How
1898.59	163.3	0.69	...	2 <i>n</i>	Lew
1898.88	165.8	0.75	...	2 <i>n</i>	Hu
1899.00	166.6	1.02	8.0...8.6	1 <i>n</i>	β

Discovered with the 18½-inch. A binary in rapid motion. It should be carefully measured each year, as it is likely to have a short period.

[β (X)... β ... β (3141)... β (*Pub. L. O. II*)... Sp. (Lew) - Lewis (*Mon. Not. LXI*, 359) (1899) (1898) (1895) - Lewis and Bowyer ()...Hussey ()...]

 β 93. W² V. 1332

R.A. 5^h 44^m 44^s *t*
Decl. +29° 53' *t*

A and B

1891.85	121.7	60.03	8.3...	2 <i>n</i>	β
1898.85	121.7	60.07	8.2...	2 <i>n</i>	β

B and C

1891.85	167.0	5.71	9.1...9.2	2 <i>n</i>	β
1898.92	162.3	5.46	9.5...11.0	1 <i>n</i>	β

B and D

1891.85	323.6	9.43	...11.2	2 <i>n</i>	β
1898.92	326.2	9.74	...11.3	1 <i>n</i>	β

The distant triple companion was noted with the 6-inch. It is not likely to have any special interest.

[β (ii)... β (*Mon. Not. XXXIII*, 437)... β (3114)... β (*Pub. L. O. II*)...]

 β 15. Lalande 11005

R.A. 5^h 41^m 48^s *t*
Decl. +2° 20' *t*

1875.60	174.3	2.07	7.8...12.0	2 <i>n</i>	J
1878.12	177.9	1.07	8.0...10.5	1 <i>n</i>	Cin
1886.89	179.8	2.08	8.1...10.2	2 <i>n</i>	LM
1898.84	178.7	2.05	7.5...11.0	1 <i>n</i>	C2

Discovered with the 6-inch. Apparently without change.

[β (i)... β (*Mon. Not. XXXIII*, 351) (1899) (1898) (1895) - Cogshall ()...]

 β 405. W² V. 1045

R.A. 5^h 42^m 22^s *t*
Decl. +15° 34' *t*

1877.95	125.1	14.59	8.5...11.8	1 <i>n</i>	β
1892.04	126.8	14.45	8.3...11.0	2 <i>n</i>	β
1899.13	129.7	14.13	8.5...11.5	2 <i>n</i>	β

Noted with the 6-inch. Without change.

[β (i)... β (2195, 3141)... β (*Pub. L. O. II*)...]

β 95. Lalande 11128

R.A. $5^h 46^m 0^s$
Decl. $-7^\circ 20'$

1878.16	298.2	13.67	8.0...	12.0	1 n	β
1892.00	296.1	13.80	8.2...	11.0	2 n	β

Discovered with the 18½-inch; *nf* 55 *Orionis*.
Probably fixed.

[β (III)... β (*Mon. Not.* XXXIII, 137)... β (3114)... β (*Pub. L. O. II*)...]

 β 563. Lalande 11156

R.A. $5^h 47^m 44^s$
Decl. $+15^\circ 29'$

1878.06	183.9	7.42	7.8...	11.0	1 n	β
1886.18	184.5	6.50	...	...	1 n	H Σ
1892.00	185.2	6.52	8.1...	10.8	3 n	β
1898.77	183.3	6.81	8.0...	11.0	3 n	β

Discovered with the 18½-inch. Probably fixed.

[β (X)... β (3114)... β (*Pub. L. O. II*)...H Σ (...)]

 β 1190. W. V. 1269

R.A. $5^h 51^m 17^s$
Decl. $+0^\circ 1'$

A and B

1890.85	340.1	1.41	7.4...	10.8	3 n	β
1898.86	337.7	1.60	7.5...	10.2	2 n	A
1898.88	341.4	1.40	7.2...	10.7	2 n	β

A and C

1890.85	95.5	6.65	...	12.5	3 n	β
1898.86	95.8	6.20	...	12.8	2 n	A
1898.88	94.7	6.36	...	11.7	2 n	β

Discovered with the 36-inch. The distant star C is noted in the Harvard Zones, where it is called 17 m, and distance estimated 8".

[β (XVII)... β (3047)... β (*Pub. L. O. II*)...Aitken (...)]

 β 1189. Sch. 125

R.A. $5^h 51^m 18^s$
Decl. $+6^\circ 28'$

A and B

1890.90	269.5	0.20	8.1...	9.1	3 n	β
1897.12	133.12	0.2	"mermaid"	...	1 n	Sp

A and C

1890.85	194.5	58.11	...	8	2 n	β
1898.88	194.5	58.02	8.2...	8.4	1 n	β

Discovered with the 36-inch. The magnitudes of A and C in D.M. are 9.0 and 9.2. D.M. (0°) 1230, 1229.

[β (XVII)... β (3047)... β (*Pub. L. O. II*)...Sp 1000]

 β 1055. *Arges* 101

R.A. $5^h 51^m 32^s$
Decl. $+44^\circ 35'$

A and B

1888.92	332.9	1.61	6.7...	11.5	3 n	β
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A and C (H. V. 121)

1783.49	315.1	3.05	1 n	H
1888.92	329.7	3.85	2	3 n β

The close companion was discovered with the 36-inch. The Herschel companion has been wholly neglected for more than a century. The above are all the measures. This star is B.A.C. 1899. The proper motion is given by KUSTNER as 0.057 in the direction of 238.6. It is pretty certain that A and B are moving together. With this proper motion and the position of C for 1888, if the small star was fixed its position at the time of HERSCHEL'S measure should have been 320°:33'8".

[10.85... β (3047)... β (3047)... β (3047)...]

β 504. *O. M.* 17 341885

$$\begin{pmatrix} \text{R.A.} & 2^h 54^m 38^s \\ \text{Decl.} & + 32^\circ 52' \end{pmatrix}$$

1877.18	37.5	1.21	9.0	1.5	β
1880.09	7.0	1.20	9.0	1.6	β
1880.02	7.3	1.27	8.5	1.6	β

Discovered with the 18 $\frac{1}{2}$ -inch. Further measures are needed.

$$[\beta 504] = \beta + \mu (1891) = 0.096 (L, O = 0.1)$$

 β 1056. *μ Comae*

$$\begin{pmatrix} \text{R.A.} & 8^h 47^m \\ \text{Decl.} & + 33^\circ 5' \end{pmatrix}$$

1877.18	27.2	16.80	3	1.4	β
1879.08	27.2	17.31		1.2	β
1879.10	27.2	17.25		1.4	β

Discovered with the 36-inch. The large star has a proper motion of 0.031 in the direction of 49.8 (*AUWERS*). It is probably only an optical pair.

$$[\beta 1056] = \beta (Comae) = 0.000 (L, O = 0.1) = 0.1$$

 β 16. *β Monocerotis*

$$\begin{pmatrix} \text{R.A.} & 6^h 12^m \\ \text{Decl.} & + 11^\circ 25' \end{pmatrix}$$

1875.14	356.1	1.8	3	10	β
1875.59	181.8	1.62	6.0	10	β
1875.61	352.2	2.12	3.8	8.5	β
1875.61	352.2	1.66	3	8.3	β
1888.99	354.0	1.69	6.0	10	β
1889.02	353.9	1.88	5.2	9.2	β
1889.04	353.5	1.82	6.0	10	β
1895.88	349.0	1.7	6.0	10	β

Discovered with the 6-inch. The measures show no relative motion. This star is involved in a large, faint nebula (*DREYER* 2142). The proper motion, according to *AUWERS*, is 0.036 in the direction of 313.3. Taking this value, and the position of the companion in 1875 from the measures of β , the small star, if fixed in space, should be 23.9: 1.14 (1898.8). It is evident from the

measures that no such relative change has occurred, and that the components, having the same proper motion, probably form a physical system.

$$[\beta 16] = \beta (32m, Var. XXXII, 151) = \text{known } (Mm, R, A, S, XLIII) \dots J (1) \dots \text{Cin}^5 \dots \text{Tarrant (2091)} \dots \text{Lx}^1 \dots \text{Cogshall } (\dots)$$

 β 803. *B.A.C.* 1935

$$\begin{pmatrix} \text{R.A.} & 8^h 50^m 40^s \\ \text{Decl.} & + 37^\circ 58' \end{pmatrix}$$

1878.92	128.0	17.00	6.2	11.5	β
1892.07	130.8	17.95	6.2	11.5	β
1898.79	127.4	17.75	6.5	11.5	β

Discovered with the 18 $\frac{1}{2}$ -inch. This is a naked-eye star near 40 *Aurigae*.

$$[\beta 803] = \beta + \mu (314) = \beta (Tab. L, O = 0.1) \dots$$

 β 1241. *β Geminorum*

$$\begin{pmatrix} \text{R.A.} & 6^h 29^m 27^s \\ \text{Decl.} & + 23^\circ 8' \end{pmatrix}$$

A and B

1891.84	344.7	0.53	5.9	10.0	β
1894.53	331.2	0.48			β

A and C

1891.85	63.3	18.30	11.4	19	β
1899.95	66.5	18.60	11.0	19	β

Discovered with the 36-inch. It is a difficult pair of the 85 *Pegasi* class. The proper motion from the *Berlin A. G. Catalogue* is very small, 0.0024 in the direction of 145.4.

$$[\beta 1241] = \beta (314) = \beta (Tab. L, O = 0.1) \dots \text{Sp. 000} \dots$$

 β 17. *β Monocerotis*

$$\begin{pmatrix} \text{R.A.} & 6^h 18^m \\ \text{Decl.} & + 11^\circ 38' \end{pmatrix}$$

A and B

1872.14	178.6	3.38	6.5	19.5	β
1875.90	178.0	3.16	6.8	19.5	β

1878.10	180.6	2.69	6.5	15.5	18	C III
1888.98	178.1	3.37			29	F
1892.02	180.4	3.21	6.0	10.4	39	B
1898.17	181.4	3.01	6.0	10.2	29	A

A and C

1872.14	244.1	10.8		11.5	19	Kn
1876.78	244.5	8.95		11.5	19	J
1892.02	246.8	8.77		10.8	39	B
1898.17	249.1	9.32		11.5	29	A

The nearest companion was discovered with the 6-inch, and in measuring that KNOTT detected the third star C. AUWERS gives the proper motion of the principal star $\alpha^{\circ}029$ in the direction of $84^{\circ}2$. With this value, and the relation of AB from the measures of J in 1875, the smaller component, if fixed, should be, for 1898.17, $189^{\circ}4 : 3^{\circ}27$. The measures show no such change in the angle, and point to a common proper motion, so far as A and B are concerned. The observations are not sufficient to decide as to C.

[311]...B (Mon. Not. XXXIII, 351); B (1114)...B (Pub. L. O. II)...Knott (Mem. R. A. S. XLIII)...Cin...Tarrant (2991)...Aitken ()...

 β 1058. 4 Geminorum

R.A. $6^{\text{h}} 13^{\text{m}} 1^{\text{s}}$
Decl. $+23^{\circ} 1'$

1880.13	284.3	0.41	7.2	7.5	29	B
1890.88	284.0	0.25 \pm			89	Sp
1891.01	281.3	0.28	6.3	6.4	39	B
1891.84	283.1	0.30	6.5	6.6	39	B

Discovered with the 36-inch. There is an error of 180° in the angle as originally printed. The proper motion of 4 Geminorum in AUWERS is $\alpha^{\circ}014$ in the direction of 270° . It is certain that this pair will prove to be a binary system. Late measures are wanting.

[8 (XV). 3 2922238, 4111111] 3 (Proc. I.) and 3p (III).]

 β 565. Lacrosse 11741

R.A. $6^{\text{h}} 2^{\text{m}} 38^{\text{s}}$
Decl. $+24^{\circ} 3'$

1878.21	100.4	1.02	8	11.2	19	B
1892.07	99.9	1.13	8.1	11.1	39	B

Discovered with the 18½-inch. Apparently unchanged. In L and W' $7\frac{1}{2}$ m; D.M. 8.2.

[8 (XV). 3 3112111, 3 3112111] 3 (Proc. I.)

 β 1242. S.D. 11431

R.A. $10^{\text{h}} 3^{\text{m}} 52^{\text{s}}$
Decl. $+5^{\circ} 18'$

A and B

1891.87	124.5	0.48	8.6	8.8	39	B
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AB and C (= H 2298)

1830	90.0	35.0	8.9	11.0	19	H
1891.87	92.9	43.97		11.07	39	B

The close pair was discovered with the 36-inch while examining the nebula No. 2182 of *Dreyer's Catalogue*. The wide pair, H 2298, is found in *Herschel's Fifth Catalogue of Double Stars*, in which he says: "The larger star has a strong nebulous burr. It is my father's IV. 38." In the 36-inch this is a large faint nebula, with the double centrally placed in it. All the measures of C are given above.

[8 (XVIII). 3 3290000, 3 3290000] 3 (Proc. I.) and 3p (III).]

 β 1017. S.D. 11431

R.A. $6^{\text{h}} 39^{\text{m}} 28^{\text{s}}$
Decl. $+27^{\circ} 50'$

1882	28.8	0.8	8.7	8.8	39	B
1892.03	28.75	0.28	8.3	8.8	39	B
1898.10	28.2	0.27			49	B

Discovered with the 18½-inch.

[8 (XVI). 3 3112111, 3 3112111] 3 (Proc. I.) and 3p (III).]

General Catalogue of Double Stars

β 1008. η <i>Camopardis</i> 22.85									
R.A. $6^h 58^m 4^s$		Dec. $+20^{\circ} 52' 5''$							
1889.05	209.4	0.66	3	8.8	2.0	β			
1891.28	500.2	0.83		3.5	4.0	III			
1886.04	209.3	0.80		0	3.0	IIo			
1897.07	209.3	0.82			5.0	Sp			
1890.06	209.7	0.07			5.0	Sp			
1890.07	209.7	0.01			4.0	Sp			
1890.04	209.8	1.04		10.5	3.0	β			
1890.03	209.7	1.08		10.7	3.0	β			
1893.22	209.0	0.09			2.0	Sp			
1894.22	209.7	0.01			2.0	Sp			
1896.22	209.6	1.05			2.0	Sp			
1897.17	209.5	1.23			1.0	Sp			

Discovered with the 12-inch on Mt. Hamilton in 1881. The measures show slow retrograde motion. AUWERS gives the proper motion of this star $\alpha'069$ in the direction of $267^{\circ}5$, and obviously this is common to both components.

In 1852 GILLISS observed a double or peculiar occultation of this star (A.N. 813), which he explains as the temporary eclipse of the star by a projecting lunar mountain. TATLOCK (*Sid. Mess.*, IV, 18) has shown that on another occasion the same observer saw this star occulted.

[β (XIII)... β (2930,3048)...Hough (2978)...Hall (II)...Sp (III)...]

β 566. <i>Monoceros</i> 21									
R.A. $6^h 59^m 34^s$		Decl. $+3^{\circ} 52' 5''$							
1878.03	219.7	1.43	3.5	12.5	1.0	β			
1892.07	209.9	1.87	6.5	12.5	3.0	β			

Discovered with the 18½-inch. This star is 6 m (or 1 m) S.E. of β 1190.

[β (XIII)... β (1413)... β (1190)...]

β 323. <i>Camopardis</i> 11.915									
R.A. $6^h 58^m 45^s$		Decl. $+3^{\circ} 41' 5''$							
1878.03	217	1.0	3.0	3.0	III				
1876.25	213	2.39	1.0	2.0	J				

1878.05	03.5	2.16	7.4...	9.0	2"	Cin
1888.18	00.3	2.13			2"	HI
1889.07	06.9	2.26	8.0...	9.6	3"	Lv

Discovered with the 6-inch. Without change.

[β (VI)... β (2062)...J (I)...Cin...Lv...HI (I, II)...]

β 193. W. VI. 208						
R.A. $6^h 59^m 4^s$		Decl. $+4^{\circ} 0' 5''$				
A and B						
1892.04	00.2	17.88	8.0...	11.0	2.0	β
1898.84	01.3	17.83	8.0...	12.0	1.0	β

A and C									
1898.84	231.1	56.55	...	10.3	1.0	β			

Discovered with the 6-inch.
[β (VI)... β (Mon. Not. XXXIV, 382)... β (3141)... β (Pub. L. O. II)...]

β 894. <i>D.M. (I)</i> 1285									
R.A. $6^h 59^m 27^s$		Decl. $+10^{\circ} 3' 5''$							
1881.14	138.0	5.14	8.2...	12.5	2.0	β			
1898.15	133.8	5.24	8	...	12	4.0	D		

Discovered with the 18½-inch. This star from the *Berlin A. G. Catalogue* has a proper motion of $\alpha'089$ in the direction of 372° . At the date of the last measure, in 1898, the companion if fixed should have been $152^{\circ}9 : 5'79$. It is therefore certain that the two stars are moving together.
[β (XIII)... β ...Doolittle (*Pub. Flower Obs.* 1)...]

β 567. <i>Monoceros</i> 23									
R.A. $6^h 59^m 31^s$		Decl. $-4^{\circ} 53' 5''$							
1879.08	249.5	3.83	6.8...	11.0	4.0	β			
1892.00	246.8	3.97	7.1...	10.9	3.0	β			

1898.10	242.4	4.26	6.0...11.0	2 ⁿ	D
1898.86	245.2	4.21	6.7...10.2	2 ⁿ	β

Discovered with the 18½-inch. Probably unchanged. In LALANDE, HEIS, and ARGELANDER 6 m. Lalande 11949.

[β (x)... β^1 ... β (3114)... β (Pub. L. O. II)...Doolittle (Pub. Flower Obsv. I)...]

β 1018. Lalande 11965

R.A. 6^h 10^m 7^s 1
Decl. = 2 50 λ

1882	60±	5 ⁿ	8.5...12.0	β
1892.06	54.7	6.02	8.5...11.7	3 ⁿ β
1899.02	53.6	5.92	9.0...11.5	1 ⁿ β

Discovered with the 18½-inch. Probably fixed.

[β (XIII)... β^1 (app.)... β (3114)... β (Pub. L. O. II)...]

β 96. 75 *Orionis*

R.A. 6^h 16^m 20^s 1
Decl. + 9 59 λ

C and D

1877.93	226.5	4.74	9.0...11.5	1 ⁿ	β
1892.12	227.0	5.10	9.0...10.7	2 ⁿ	β
1898.92	224.3	4.79	9.8...12.0	1 ⁿ	β

A and C

1892.12	150.5	119.00	6	...	2 ⁿ β
1898.79	150.2	119.32	...	...	1 ⁿ β

A and B

1892.12	255.5	62.88	...	10.2	2 ⁿ β
1898.79	256.0	62.83	...	...	1 ⁿ β

The faint double companion was noted with the 6-inch. AUWERS gives the proper motion of A 0.060 in 191.3.

[β (II)... β (Mon. Not. XXXIII, 1870)... β (3141)... β (Pub. L. O. II)...]

β 18. Lalande 12006

R.A. 6^h 11^m 7^s 1
Decl. = 12 0' λ

1876.00	271.9	1.79	7.3... 9.0	3 ⁿ	J
1877.97	273.5	1.54	7.5... 9.0	1 ⁿ	Cin
1885.14	276.9	1.77	7.0... 9.5	1 ⁿ	W
1886.52	275.9	1.68	8.0... 9.0	1 ⁿ	L.M
1892.93	273.5	1.21	8.0... 9.0	1 ⁿ	J

Discovered with the 6-inch. Apparently fixed.

[β (I)... β (Mon. Not. XXXIII, 351)... β (I)...Cin...Wilson (Cin¹⁰)...Jones (Proc. Haverford Coll. Obsv. 1892)...]

β 1019. S.D. (3ⁿ) 1373

R.A. 6^h 11^m 26^s 1
Decl. = 3 0 λ

1882	280±	1 ⁿ	8.0... 9.5	β
1892.06	274.2	0.81	8.0... 9.6	3 ⁿ β
1898.88	277.6	0.80	8.3... 9.7	1 ⁿ β

Discovered with the 18½-inch.

[β (XIII)... β^1 (app.)... β (3141)... β (Pub. L. O. II)...]

β 895. W. VI. 287

R.A. 6^h 12^m 23^s 1
Decl. + 28 29 λ

A and B

1873.9	Elongation suspected in 20... with 6-inch			β
1875.9	Appeared round with 18½ inch			β
1879.00	Elongated in 18... 18½ inch			β
1879.22	133.3	0.27	7.5... 7.5	1 ⁿ β
1887.17	143.5	0.25		3 ⁿ SP
1888.94	150.9	0.2		5 ⁿ SP
1891.18	144.6	0.22	8.2... 8.3	3 ⁿ β
1891.78	146.0	0.21	8.1... 8.3	3 ⁿ β
1898.24	185.8	0.35		1 ⁿ β

AB and C (Σ 888)

1831.22	246.2	2.70	7.5	0.2	3 ⁿ Σ
1841.29	247.0	2.45			3 ⁿ M4
1857.16	250.8	2.77			1 ⁿ SP
1869.83	249.8	2.05	7.2...	9.5	4 ⁿ J
1879.22	250.3	2.83		9.5	1 ⁿ β
1888.94	252.9	2.60			2 ⁿ SP
1891.22	250.2	2.87			2 ⁿ β

β 1191. Lalande 12262

R.A. $6^h 16^m 8^s$ \downarrow
Decl. $+18^\circ 50'$ \downarrow

1890.93 161.5 1.33 7.0...13.8 3 u β

Discovered with the 36-inch. The *Berlin A. G. Catalogue* gives the proper motion of this star $0''.205$ in the direction of $222^\circ 2$. If this is substantially correct, another measure will show whether the components are moving together. If the companion is fixed in space, its position for 1898.9 would be $91^\circ 8' : 17.51$.

[β (XVII)... β (3047)... β (Pub. L. O. 111)...]

 β 569. Lalande 12315

R.A. $6^h 19^m 37^s$ \downarrow
Decl. $+10^\circ 52'$ \downarrow

1877.99 120.7 1.84 8.2...10.5 1 u β
1878.62 118.8 1.54 8.0...10.2 2 u Cin
1886.89 115.2 1.99 8.0...9.7 2 u LM
1898.10 115.5 2.07 8.0...10.0 3 u D

Discovered with the 18½-inch. Change uncertain.

[β (XI)... β ...Cin...LM...D...little (Pub. Flower Obs. 1)...]

 β 1192. ν Geminorum

R.A. $6^h 21^m 50^s$ \downarrow
Decl. $+20^\circ 17'$ \downarrow

B and C

1890.88 346.2 0.15 8.7...8.8 3 u β
1899.12 346.4 0.20 9.0...9.5 1 u A

A and BC (Σ 64pp. 77)

1876.02 329.1 112.54 4.2...8.0 3 u J
1890.86 329.3 112.60 ... 3 u β
1895.53 329.5 112.87 4.5...7.4 3 u I
1899.08 329.6 112.71 ... 2 u β

The duplicity of the distant companion was discovered with the 36-inch. This star is Lalande

12358. The principal star has a proper motion of $0''.0315$ in the direction of $259^\circ 0$ (AUWERS). All the measures of O Σ (app.) 77 are given above.

The following positions are derived from meridian observations:

1860	329.7	111.20	Lalande
1875	329.4	112.64	A. G. C.

The large telescope shows a number of faint stars nearer the primary than BC. The nearest is the only one seen with any difficulty.

Aa	1890.88	358.0	22.65	...15	3 u	β
Ab	1890.87	13.3	53.90	...13.8	2 u	β
Ac	1890.87	254.6	56.76	...12.5	2 u	β
Ad	1890.87	11.6	92.13	...13	2 u	β

[β (XVII)... β (3047)... β (Pub. L. O. 111)... β (111)... β (3464)...Aitken (...)]

 β 570. 11 Monocerotis

R.A. $6^h 27^m 0^s$ \downarrow
Decl. $-6^\circ 57'$ \downarrow

A and D

1878.02	56.1	25.70	5	...12.5	3 u	β
1898.90	55.2	25.03	...	13.0	2 u	β

A and B (Σ 61pp)

1831.23	130.0	7.25	5.0...	5.5	3 u	Σ
1854.20	131.2	7.33	...	...	3 u	J
1878.38	131.2	7.23	5.7...	5.7	3 u	Σ
1898.96	133.4	7.44	...	...	1 u	β

B and C

1831.23	101.7	2.46	...	...	3 u	Σ
1854.20	101.0	2.53	...	...	3 u	J
1878.38	104.9	2.70	...	...	3 u	Σ
1898.90	108.4	2.95	...	...	1 u	β

The distant companion was noted with the 18½-inch. The principal star, according to AUWERS, has a proper motion of $0''.050$ in the direction of $299^\circ 4$, and obviously the two Σ companions are moving with it, as there has been no relative change

β 754. Lacaille 2350

R.A. $6^h 30^m 22^s$ t
Decl. $-33^\circ 55'$

1879.79	20.4	0.5	6.5...	7.0	β
1892.14	22.8	...	...	...	1 n LV
1892.18	36.5	0.78	8.0...	8.2	2 n β
1897.77	16.2	0.92	6.2...	7.5	1 n See

Discovered with the 6-inch on Mt. Hamilton in 1879. Further measures are necessary to show whether or not there is any motion. There is a star 11 m, $40^\circ : 25''$. The principal star in Lac. $5\frac{1}{2}$ m, Gould 7.0.

[β (XI)... β (3141)... β (*Pub. L. O. 1, 11*)...LV (A. J. 278)
(*Proc. Haverford Coll. Obs.*, 1892)...See (3495)...]

 β 755. Argus 34

R.A. $6^h 31^m 14^s$ t
Decl. $-36^\circ 41'$

A and B

1879.79	25.0	1.4	6.0...	7.5	β
1887.24	253.1	0.77	6...	7	2 n Pol
1891.11	252.7	0.91	6...	7	1 n Sel
1897.17	260.6	1.09	6.2...	9.8	1 n See

AB and C (= H 3875)

1837.9	295.7	20.7	6...	13	2 n H γ
1887.25	301.0	21.22	...	11	1 n Pol
1891.11	300.4	20.87	...	...	1 n Sel
1897.17	301.8	21.83	...	12.9	1 n See

The duplicity of the principal star of H 3875 was discovered with the 6-inch at Mt. Hamilton in 1879. Further observations will be necessary to show the nature of the relation. All the measures of the Herschel companion are given above. A naked-eye star in *Argo*, Lacaille 2359.

[β (XI)... β ...Herschel (*Cape Obs.*)...Russell (*Mon. Not. XLVII*, 473)...Pollack (*Mem. R. A. S. 1*)...*Pub. Sydney Obs.*, 1891)...Sellers (3154)...See (3495)...]

 β 571. W. V. 0560

R.A. $6^h 34^m 20^s$ t
Decl. $-6^\circ 13'$

1877.95	316.2	2.73	6.0...	12.0	1 n β
1886.22	307.7	2.88	...	...	1 n H Σ

1892.15	317.9	3.05	6.9...	11.2	3 n β
1899.08	322.4	2.49	7.0...	13.0	2 n β

Discovered with the 18 $\frac{1}{2}$ -inch. In Heis 6-7 m; D.M. 7.0. It is wanting in many of the star catalogues where a star of this brightness should be found.

[3 (XI)... β ...3 (3141)...3 (278) L. O. 11...H Σ ...]

 β 19. Lalande 12936

R.A. $6^h 36^m 30^s$ t
Decl. $-15^\circ 53'$

1874.14	169.4	4.07	7.2...	9.5	1 n Kn
1876.26	165.0	3.52	6.7...	9.0	3 n J
1877.12	164.5	3.66	7.0...	9.0	2 n Cin
1885.65	168.7	3.58	7.5...	9.7	2 n W
1887.95	165.2	3.54	6.8...	9.0	2 n T
1888.12	166.6	3.70	7.8...	9.4	3 n LV
1888.86	167.0	3.65	6.5...	9.0	2 n T
1898.16	165.2	3.92	...	...	1 n See

Discovered with the 6-inch. Apparently fixed.

[β (I)... β (*Mon. Not. XXXIII*, 351)...Knott (*Mem. R. A. S. XLIII*)...J (I)...Cin 4 ...Wilson (Cin 6)...Lv 4 ...Tarrant (2899, 2991)...See ()...]

 β 195. O. Arg. S. 5539

R.A. $6^h 37^m 20^s$ t
Decl. $-23^\circ 7'$

A and B

1877.13	217.6	6.25	7.0...	11.0	1 n Cin
1892.18	215.2	5.71	7.1	11.1	1 n LV
1898.23	212.9	5.97	...	...	1 n S
1898.84	219.9	5.77	7.5...	10.5	1 n β

A and C

1892.18	178.4	35.14	...	12.0	1 n LV
1898.23	177.0	34.27	...	...	1 n See
1898.84	178.0	34.71	...	11.3	1 n β

Discovered with the 6-inch. There is no material change.

[3 (XI)...3 (Herschel Arg. XXXVI, 387)...Cin 4 ...Lv 4 ...Tarrant (*Proc. Haverford Coll. Obs.*, 1892)...See ()...]

β 750

R.A.	6 ^h 41 ^m 33 ^s
Decl.	+ 23° 55'

This 8 or 8½ m star was suspected with the 6-inch on Mt. Hamilton in 1879 to be a very close pair. I could find no double in or near this place with the 36-inch, 1890.78.

[β (VII)... β (2062)...Cin⁴...Lv¹...Jones (Proc. Haverford Coll. Obs., 1892)...Sellers (3303)...See ()...Doollittle (Pub. Flower Obs., 1)...]

 β 20. Lacaille 13179

R.A.	6 ^h 43 ^m 25 ^s
Decl.	+ 16° 45'

1879.32	29.8	3.20	7.7...11.1	4 ⁿ	J
1878.12	29.3	2.95	8.0...10.5	1 ⁿ	Cin
1880.34	34.6	2.99	7.8...10.8	3 ⁿ	β
1886.13	38.1	3.70	8.0...11.0	1 ⁿ	L.M
1886.16	30.6	2.96	8.0...11.0	1 ⁿ	W
1888.54	34.5	3.12	8.0...10.6	3 ⁿ	Lv
1898.22	31.3	3.44	...	1 ⁿ	See
1899.00	32.7	3.12	8.0...10.0	1 ⁿ	β

The middle of three stars *nf Sirius*; discovered with the 6-inch. The measures do not show any motion.

[β (1)... β (Men. Not. XXXIII, 351)... Δ (1)... β ...Cin⁵...Lv¹...LM...Wilson (Cin¹⁰)...See ()...]

 β 1103. *γ* Gemination

R.A.	6 ^h 42 ^m 21 ^s
Decl.	+ 21° 53'

1879.32	1.23	1.7	1.45	3 ⁿ	β
1881.2	1.02	1.02	1.05	1 ⁿ	β

Discovered with the 36-inch. The *Berlin A. G. Catalogue* gives the proper motion of this star 0".043 in the direction of 208.8. There is a 13 m star,

[β (VII)... β (2062)...Cin⁴...Lv¹...Jones (Proc. Haverford Coll. Obs., 1892)...Sellers (3303)...See ()...Doollittle (Pub. Flower Obs., 1)...]

[β (VII)... β (2062)...Cin⁴...Lv¹...Jones (Proc. Haverford Coll. Obs., 1892)...Sellers (3303)...See ()...Doollittle (Pub. Flower Obs., 1)...]

 β 807. *Monoceros* α_7

R.A.	6 ^h 41 ^m 42 ^s
Decl.	+ 23° 55'

1879.14	30.9	5.60	6.5...12.0	3 ⁿ	β
1892.20	32.0	6.00	6.2...11.4	3 ⁿ	β
1898.84	31.8	5.74	6.0...12.5	1 ⁿ	β

Discovered with the 18½-inch. The principal star (Lalande 13198) has a considerable proper motion:

Stumpe	-	-	0.182 in 170.5
Glasgow 2d	-	-	0.225 in 180.0
Porter	-	-	0.162 in 183.7

The measures show that this is common to both components.

[β (VIII)... β (3114)... β (Dun. I, C, D)...]

 β 324. Lacaille 2462

R.A.	6 ^h 44 ^m 45 ^s
Decl.	+ 23° 50'

A and B

1877.11	202.5	1.88	7.0...8.0	2 ⁿ	Cin
1889.04	203.3	1.71	7.1...8.4	3 ⁿ	Lv
1892.93	199.0	1.74	7.0...8.2	1 ⁿ	J
1894.13	208.3	2.±	7...9	1 ⁿ	Sel
1898.14	203.3	2.60	...	1 ⁿ	See
1898.14	203.3	1.93	7...8	3 ⁿ	D

AB and C (= S 537)

1825.16	281.9	30.30	7...11	3 ⁿ	South
1898.14	281.1	30.68	...	1 ⁿ	See
1898.14	281.8	30.93	...9	1 ⁿ	D

AB and D

1898.14	2.8	28.26	...	1 ⁿ	See
1898.14	2.4	30.27	...13	3 ⁿ	D

The duplicity of the larger star of South's wide pair was discovered with the 6-inch. No change is apparent in any of the components.

[β (VII)... β (2062)...Cin⁴...Lv¹...Jones (Proc. Haverford Coll. Obs., 1892)...Sellers (3303)...See ()...Doollittle (Pub. Flower Obs., 1)...]

β 898. O. Arg. S. 5753R.A. $6^h 45^m 11^s$
Decl. $-15^\circ 53' A$

A and B

1879.75	350.2	2.95	7.8...11.3	5 ^u	β
1886.11	349.8	3.23	8...11	1 ^u	LM
1892.00	357.5	3.23	8.0...9.5	3 ^u	β
1898.22	354.8	3.40	...	1 ^u	See
1899.02	353.6	3.01	8.0...10.5	1 ^u	β

C and D

1879.52	271.7	1.54	9.8...10.6	3 ^u	β
1892.00	270.3	1.91	9.1...9.3	3 ^u	β
1898.22	266.8	2.11	...	1 ^u	See
1899.02	268.8	1.79	9.0...9.2	1 ^u	β

A and C

1879.69	283.1	96.50	...	2 ^u	β
1892.00	282.1	96.77	...	3 ^u	β
1898.22	282.1	96.49	...	1 ^u	See
1898.84	282.5	97.26	...	1 ^u	β

A quadruple in the vicinity of *Sirius*; discovered with the 6-inch. Probably without change.

[β (XIII)... β ... β (1114)... β (Pub. Fl. C. III)...LM...See (1...)]

 β 325. O. Arg. S. 5814R.A. $6^h 40^m 59^s$
Decl. $-26^\circ 26' A$

1877.11	32.1	2.05	8.0...9.0	1 ^u	Cin
1884.00	37.0	2.06	9.0...10.0	1 ^u	W
1897.84	37.2	1.81	7.5...9.0	1 ^u	See
1898.10	32.3	1.79	8...9.7	3 ^u	D

Discovered with the 6-inch; the *sf* of a wide pair. Probably fixed. The magnitude in Cord. D.M. is 7.7.

[β (vi)... β (2662)...Cin...Wilson (Cin)...See (3495)...Doollittle (Pub. Flower Obs. 1)...]

326. Lalande 13404R.A. $6^h 49^m 57^s$
Decl. $-2^\circ 28' A$

1876.19	63.0	1.23	8.0...9.0	2 ^u	H1
1876.83	62.8	1.25	8.0...9.5	2 ^u	J
1882.21	67.6	1.20	8.0...9.5	2 ^u	Sp
1886.22	58.2	1.47	...	2 ^u	H1 Σ
1888.20	65.8	1.04	...	2 ^u	H1
1888.83	64.5	1.13	8.0...9.2	4 ^u	1 ^u
1893.20	60.5	1.08	8.0...9.2	1 ^u	J
1898.18	56.4	1.33	...	1 ^u	Br

Discovered with the 6-inch. No material change.

[β (vi)... β (2662)... β (1)...Sp (ii)...Lv...Hall (i, ii)...O Σ (Poulkova Obs. X)...H Σ ()...Jones (A. J. 312)...Brown ()...]

 β 899. W* VI. 1526R.A. $6^h 52^m 03^s$
Decl. $-18^\circ 53' A$

A and B

1879.14	261.4	0.68	9.0...9.0	1 ^u	β
1889.78	263.9	0.57	...	3 ^u	Sp
1892.13	268.0	0.58	8.7...9.3	2 ^u	β
1896.11	265.1	0.81	...	1 ^u	Low

AB and C

1879.14	174.2	24.07	...10	2 ^u	β
1892.13	175.5	24.33	...	2 ^u	β
1899.05	179.0	24.10	...	2 ^u	β

AB and D

1879.14	18.1	40.46	...	2 ^u	β
1892.13	47.8	40.46	...	2 ^u	β
1899.05	48.1	40.60	...	2 ^u	β

Discovered with the 18-inch (in C. 1879) in A) as probable. W* VI. 1526.

[β (XIII)... β (1114)... β (Pub. Fl. C. III)...See (3495)...Lewis (Mon. M. 11X, 400)...]

β 327. Lalande 13317

R.A. $6^h 56^m 28^s$
Decl. $-2^{\circ} 35' 30''$

A and B

1875.63	20.8	20.8	7.5...	8.0	26	J
1876.12	96.8		8.0...	8.5	12	Cin
1880.00	96.1	7.5	7.5	7.5	19	β
1888.10	96.1	7.5	8.0...	8.2	29	Lv
1898.00	95.5	7.4	7.5	8.0	42	T
1892.00	93.8	0.79	8.2...	8.2	35	β
1892.13	93.7	0.64			42	Sp
1898.00	90.6	0.63			35	Sp
1899.09	93.0	0.59	8.0...		12	β

A and C

1876.83	102.6	13.22	11.5	29	J
1878.12	99.4		11.5	12	Cin
1880.63	100.2	13.24	11.2	29	β
1898.02	97.5	13.24	11.5	49	T
1892.10	100.0	13.10	11.6	29	β
1899.09	98.9	13.22	11.0	19	β

Discovered with the 6-inch. No material change.

[β (VI)... β (1892)...(1411)... β (70)... β (Cin)
Lv⁴...Tarrant (2991)...Sp (III)...]

 β 1060. Lalande 13471

R.A. $6^h 59^m 38^s$
Decl. $-3^{\circ} 40' 30''$

1889.15	58.3	3.11	7.0...	12.0	29	β
1899.02	59.3	3.11	6.8	13.5	19	β

Discovered with the 36-inch.

[β (XV)... β (2929)... β (Pub. L. O. II)...]

 β 1022. W. & F. 1337

R.A. $6^h 59^m 11^s$
Decl. $-3^{\circ} 42' 30''$

A and B

1878.17	241.8	7.0	7.5	8.1	β
1878.21	246.9	7.5	7.5	8.1	β

B and C

1878.17	241.8	7.0	7.5	8.1	β
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Discovered with the 18 $\frac{1}{2}$ -inch. There must be change in both angle and distance of the close pair.

[β (III)... β (app)...]

 β 100. W. & F. 1623

R.A. $6^h 51^m 14^s$
Decl. $-3^{\circ} 42' 34''$

1875.36	258.1	3.27	7.0...	10.8	39	J
1880.63	262.0	3.14	7.5...	10.0	29	β
1888.64	258.8	3.17	8.0...	10.4	29	Lv
1892.13	256.0	2.92	7.5...	11.0	19	Col

Discovered with the 6-inch. Fixed.

[β (II)... β (Mon. Not. XXXIII, 437)... β ... β (I)...Lv⁴...
Collins (Proc. Haverford Coll. Obs., 1892) (A. J. 278)...]

 β 572. Lalande 13623

R.A. $6^h 55^m 24^s$
Decl. $-2^{\circ} 28' 30''$

1879.39	143.9	5.07	7.2...	11.0	39	β
1892.12	142.6	5.27	6.9...	11.0	39	β
1897.80	143.9	5.02	6...	10.7	19	See
1899.09	142.4	5.13	7.5...	10.2	29	β

Discovered with the 18 $\frac{1}{2}$ -inch. Probably unchanged. Many small stars in the field.

[β (XV)... β ... β (1411)... β (170)... β (O. II)...See (3495)...]

 β 573. Lalande 13642

R.A. $6^h 50^m 11^s$
Decl. $-3^{\circ} 42' 30''$

1878.17	241.8	7.0	7.5	8.1	29	Cin
1878.21	246.9	7.5	7.5	8.0	19	J
1879.13	248.6	7.5	8.0...	8.2	19	β
1899.19	256.3	0.74			29	β

Discovered with the 18 $\frac{1}{2}$ -inch. This star is 7.0 m in Radcliffe and S.D.

[β (X)... β ... β ... β (I)...Cin⁵...]

β 900. Lalande 13688

R.A. 6^h 58^m 33^s $\frac{1}{2}$
Decl. + 21 11 $\frac{1}{2}$

1880.20	272.6	1.58	8.2...	11.7	2 ⁿ	β
1892.21	273.0	1.70	8.0...	11.5	3 ⁿ	β

Discovered with the 18½-inch; 40' nf ζ *Geminorum*. Without material change.

[β (XIII)... β^3 ... β (3141)... β (*Pub. L. O. II*)...]

 β 328. *Canis Majoris* 139

R.A. 7^h 1^m 3^s $\frac{1}{2}$
Decl. + 11 7 $\frac{1}{2}$

A and B

1875.70	128.4	0.3	6.3...	7.5	4 ⁿ	J
1878.17	127.8	...	6.0...	8.7	2 ⁿ	Cin
1879.13	117.8	0.48	7.0...	8.5	1 ⁿ	β
1880.44	122.3	0.51	6.2...	7.5	4 ⁿ	Sp
1887.18	116.1	0.42	...	...	2 ⁿ	Sp
1891.15	116.4	0.45±	...	...	2 ⁿ	Sp
1892.11	118.0	0.51	6.3...	7.6	4 ⁿ	β
1892.23	115.8	0.5±	...	...	1 ⁿ	Sp
1893.23	119.2	0.5±	...	...	2 ⁿ	Sp
1899.26	132.3	0.43	6.5...	8.0	1 ⁿ	β

AB and C (\approx 1026 *ref.*)

1879.13	349.9	17.85	...	9.0	1 ⁿ	β
1892.04	348.9	17.45	...	10.4	3 ⁿ	β
1899.26	350.3	17.40	...	...	1 ⁿ	β

The large star of this wide pair was found to be a close double with the 6-inch. Motion is uncertain. This is a naked-eye star in *Canis Major*, 6 m in Argelander, Heis, and *Pos. Med.* Lalande 13811.

[β (VI)... β (2062,3114)... β^3 ... β (*Pub. L. O. II*)... β (I)... β (Cin)... β (II, II app., III)...]

 β 574. Lalande 13821

R.A. 7^h 1^m 18^s $\frac{1}{2}$
Decl. + 11 9 $\frac{1}{2}$

1878.04	306.7	1.70	8.0...	12.7	1 ⁿ	β
1892.04	311.3	2.20	8.1...	11.4	3 ⁿ	β
1898.88	302.3	2.28	8.0...	12.8	1 ⁿ	β

Discovered with the 18½-inch.

[β (XI)... β^3 ... β (3114)... β (*Pub. L. O. II*)...]

 β 1009. τ *Geminorum*

R.A. 7^h 3^m 26^s $\frac{1}{2}$
Decl. + 36 26 $\frac{1}{2}$

1882.01	178.2	1.87	5	...	11.5	2 ⁿ	β
1890.96	177.6	1.75		...	13.2	4 ⁿ	β

This fine and difficult pair was discovered at Mt. Hamilton with the 12-inch in 1881. AUWERS gives the proper motion, 0.064 in the direction of 222°. The measures are sufficient to show from the common proper motion that this is a physical pair. If the small star was fixed in space its position angle would be diminished 13° in the interval 1882-1890.

[β (XIII)... β^3 ... β (3048)... β (*Pub. L. O. II*)...]

 β 329. *Canis Majoris* 146

R.A. 7^h 4^m 6^s $\frac{1}{2}$
Decl. + 16 24 $\frac{1}{2}$

1880.67	97.6	29.52	6.4...	11.7	2 ⁿ	β
1892.12	96.8	29.84	6.2...	11.5	3 ⁿ	β
1898.16	96.5	30.02	...	...	1 ⁿ	See
1898.80	97.3	29.78	6.2...	11.6	2 ⁿ	β

Distant companion noted with 6-inch. A naked-eye star (Lalande 13928); Heis 6 m; S.D. 7.2; Cord. 6.6. See notes a nearer star, 14.8 m, 110° 6', which I could not see on the occasion of the last measures with the 40-inch.

[β (VI)... β (2062,3141)... β^3 ... β (*Pub. L. O. II*)... β (Cin)...]

 β 1270. δ 133 1773

R.A. 7^h 4^m 26^s $\frac{1}{2}$
Decl. + 34 54 $\frac{1}{2}$

1899.23	180.4	1.02	9.0...	9.3	1 ⁿ	β
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This was noted with the 18½-inch on Dec. 1871, 16, 1878, but forgotten subsequently, and not measured or included in my catalogues of that time. A recent examination of my old observing book led to its recovery with the 40-inch. This instrument shows δ 1330 840, 340 S. 147°.

β 106. W 131 113

R.A. $7^h 00^m 27^s$
 Decl. $-2^{\circ} 14'$

1876.83	186.7	3.52	10.0...11.0	1 α	J
1876.24	186.0		8.3	10.0	1 α Cin
1880.20	186.7	3.33	9.5	11.0	1 α B
1882.12	186.1	2.92	9.0	11.0	1 α W
1886.04	186.8	3.29	10.0	10.0	1 α B

Discovered with the 6-inch. The f one of three stars in the field.

[β (111)... β (186)... β (188)... β (182)...J (1)...Cin?...Wilson (Cin)...]

 β 107. Latitude 14026

R.A. $7^h 7^m 11^s$
 Decl. $-6^{\circ} 37'$

1876.86	147.0	2.28	7.7...10.2	2 α	J
1877.42	147.2	1.92	7.0	9.5	1 α Cin
1886.94	144.8	2.21	8.0...9.3	1 α	LM
1888.13	147.8	2.17	8.1	9.1	3 α LV

Discovered with the 6-inch. Without change.

[β (111)... β (186)... β (182)...J (1)...Cin...LM...LV...]

 β 1023. 1451, 201, 1442

R.A. $7^h 11^m 38^s$
 Decl. $+2^{\circ} 51'$

1862	110.0	1.8	5.5	5.5	β
1877.43	204.0	0.25	5.4	5.5	3 α β
1888.11	204.0	0.25	5.3	5.6	1 α A

This star was suspected with the 18 $\frac{1}{2}$ -inch to be a close pair in 1882, and subsequently verified and measured with the 36-inch.

[β (XIII)... β (186)... β (3114)... β (Pub. L. O. II)...Aitken (1882)...]

 β 757. 1451, 201, 1442

R.A. $7^h 11^m 38^s$
 Decl. $+2^{\circ} 51'$

1877.43	65.8	2.21		7.5	3 α β
				3.6	1 α P

1887.23	67.7	2.57	0.5...8.0	2 α	Pol
1893.15	62.6	2.06	7...9	2 α	Sel
1897.20	60.2	3.06	6.3...11.8	2 α	See

Discovered with the 6-inch on Mt. Hamilton in 1879. This is a naked eye star in *Arges*. Lacaille 2628. There would appear to be some change, but this needs confirmation. There is a wide difference in the magnitudes assigned to the smaller star.

[β (XII)... β (186)... β (182)...J (1)...Cin?...Wilson (Cin)...]

 β 1268. 24 *Monocerotis*

R.A. $7^h 00^m 11^s$
 Decl. $+0^{\circ} 8'$

1892.21	313.2	3.81	6.0...11.8	4 α	β
1898.94	310.6	3.90	6.0...13.0	2 α	A
1899.11	309.9	3.85		2 α	Hu

This is one of the rejected stars (OS 169) of the Poulkova Catalogue. In the edition of 1850 it was given as "oblong?" the direction of the suspected elongation being roughly measured on two occasions 199° and 204°. MADLER has two observations (*Dorpat Observations* XI, XIII, 20.4; 0.5 (1843.28) and 22.2; 0.35 (1846.24). Subsequently DEMBOWSKI (*Measures*, Vol. I. 228) thought it might be elongated in 148°, but very uncertain. In 1873 I had a faint suspicion of a slight elongation in 310°, but it was very doubtful in 1874. It was finally rejected as single by OTTO STRUVE, and is probably not a close pair. It was certainly round in 1892 with all powers on the 36-inch. In the course of this examination I found the faint companion given above. It is not probable that this has anything to do with the early observations previously mentioned. The faintness of this star is a sufficient explanation of the failures to see it with other telescopes.

AUWERS gives for the proper motion of this star, 0.031 in the direction of 284°. The measures do not cover a sufficient time to show with certainty whether the small star shares in this movement.

[β (XIX)... β (3141)... β (Pub. L. O. II)...Aitken (1882)...Hussey (1882)...]

β 575. Canis Majoris 156

R.A. $7^h 9^m 21^s$ t
Decl. $-15^{\circ} 16'$ λ

A and B

1878.18	199.2	0.69	8.0...	8.0	2 n	β
1878.17	195.3	...	7.8...	8.2	3 n	Cin
1889.15	199.9	0.70	8.0...	8.0	1 n	Lv
1898.29	220.8	0.34	...	...	1 n	See
1899.19	216.0	0.64	...	...	1 n	A

AB and C ($\Sigma 1057$)

1831.20	1.9	15.28	7.3...	9.8	3 n	Σ
1845.20	1.9	16.10	...	...	1 n	Ma
1867.99	1.5	15.50	7.0...	9.8	3 n	J
1878.10	2.1	15.87	...	...	2 n	β
1898.29	2.4	15.74	...	...	1 n	See

The duplicity of the principal star of $\Sigma 1057$ was discovered with the 18½-inch.

There is no sensible change in the distant star, C. All the measures are given. Lalande 14114.

[β (X)... β^1 ...Cin 5 ...Lv 1 ...See (... Madler (Fixstern-Systeme I)...J (II)...Aitken (...)]

β 330. D.M. (-0°) 1689

R.A. $7^h 13^m 27^s$ t
Decl. $-0^{\circ} 41'$ λ

1876.87	218.0	1.28	8.7...	10.5	2 n	J
1878.12	211.7	1.22	8.5...	9.0	1 n	Cin
1886.84	213.5	1.25	8.5...	9.0	1 n	LM
1888.42	215.6	1.23	8.0...	9.5	2 n	Lv

Discovered with the 6-inch. Probably without change.

[β (VI)... β (2062)...J (I)...Cin 5 ...Lv 1 ...LM...]

β 901. 65. Antares

R.A. $7^h 11^m 1^s$ t
Decl. $+30^{\circ} 59'$ λ

A and B

1879.31	7.9	10.56	5.8...	12.3	3 n	β
1881.29	8.5	11.00	5.0...	11.5	1 n	O Σ

1888.77	9.3	11.16	...	...	4 n	H Σ
1891.18	9.1	11.14	...	11.5	3 n	β
1898.08	7.5	10.90	6.0...	12.2	2 n	β

A and C

1879.51	26.8	39.05	...	12.7	2 n	β
1898.08	30.3	37.76	...	12.7	2 n	β

Discovered with the 18½-inch. AUWERS assigns to this star a proper motion of 0.097 in the direction of 264°.7. With the position of B in 1879, and this annual movement of A, the companion, if fixed in space, should be 17°1' 11.12" for 1898. It is therefore very probable that it is moving with the principal star, while the more distant companion is fixed.

[β (XIII)... β^1 ... β (3114)... β (Pub. L. O. V. O Σ (P. 1000) Obs. X)...H Σ (...)]

β 577. Piazzi VII. 53

R.A. $7^h 14^m 21^s$ t
Decl. $+9^{\circ} 48'$ λ

AB and C

1892.19	100.0	12.75	...	13.5	2 n	β
1895.19	106.1	14.15	...	...	1 n	Lew
1896.25	103.5	13.77	...	13.2	1 n	Lew
1899.08	97.9	12.42	...	13.3	3 n	β

AB and D

1878.21	9.9	14.54	...	13	1 n	β
1892.19	10.6	15.31	...	13	2 n	β
1897.27	10.7	15.17	...	...	1 n	A
1899.09	10.8	15.25	...	13	1 n	β

AB and E

1892.18	278.0	53.62	...	13.8	3 n	β
1897.27	278.2	54.23	...	...	1 n	A

A and B ($\Sigma 6714$)

1831.54	118.1	0.48	7.8	8.2	3 n	Σ
1899.93	130.4	0.62	...	...	3 n	O Σ
1882.89	114.5	0.64	7.7	8.1	3 n	β
1888.73	130.9	0.82	7.8	8.0	3 n	Lv
1892.18	142.7	0.53	8.1	8.3	3 n	β
1893.19	137.4	0.58	...	...	2 n	Lew
1896.25	133.8	0.68	...	...	1 n	Lew
1897.29	130.7	0.86	8	8.6	1 n	A

β (IV)... β (*Mon. Not.* xxxiv, 382)...*Annals Harvard (phy.*
xiii...See ()...Aitken ()...]

β 21. η *Canis Minoris*R.A. $7^h 21^m 35^s$ t
Decl. $+7^\circ 11'$ λ

1875.39	27.4	4.00	5.5...11.3	3 u	J
1877.23	22.7	3.70	6...10.5	1 u	O Σ
1886.28	23.6	4.01	...	1 u	H Σ
1891.96	25.8	3.99	5.7...11.2	3 u	β
1898.12	24.3	4.33	6...11	2 u	A
1898.25	28.2	4.04	...	2 u	L

Discovered with the 6-inch. Probably without change. The proper motion of the principal star is $0''.022$ in the direction of $216^\circ.7$ (AUWERS). If the small star was fixed in space, the movement would increase the distance $0''.5$ in the time covered by the measures.

[β (1)... β (*Mon. Not. XXXII*, 351)... β (3114)... β (*Pub. L. O.* II)... β (1)...O Σ (*Poulkova Obs.* X)...Lewis (*Mon. Not. LIX*, 400)...Aitken ()...H Σ ()...]

 β 578. Lalande 14545R.A. $7^h 21^m 47^s$ t
Decl. $-17^\circ 37'$ λ

1878.17	52.4	...	6.0...12.0	2 u	Cin
1878.20	53.6	2.44	6.5...11.8	1 u	β
1878.22	50.6	2.51	7.5...10.5	1 u	J
1886.16	48.7	2.33	7.7...10.7	2 u	W
1898.21	46.8	2.29	...	1 u	See
1898.26	46.4	2.26	6.3...10.9	3 u	A

Discovered with the 18½-inch. Very little, if any, change. The distance in my measure of 1878 is erroneously given in β^* as $1''.2$. This is a naked-eye star in *Argo*; S.D. 6.0 m.

[β (X)... β^* ... β (1)...Cin 2 ...Wilson (Cin 20)...See ()...Aitken ()...]

 β 332. *Piazzi VII*, 116R.A. $7^h 22^m 13^s$ t
Decl. $-11^\circ 19'$ λ

A and B

1875.52	166.3	0.80	6.3...8.2	3 u	J
1878.19	168.2	0.90	6.4...8.2	2 u	Cin
1880.65	169.1	1.07	6.3...8.2	7 u	Sp
1887.15	165.8	0.89	6.3...8.2	6 u	T

1887.18	165.9	0.86	...	2 u	Sp
1892.04	168.7	0.85	6.8...8.1	3 u	β

AB and D

1878.10	157.2	23.41	...	9.8	2 u	β
1892.10	157.8	23.32	...	11.0	2 u	β
1899.05	156.8	23.08	...	11.0	1 u	β

AB and E

1878.16	41.4	31.56	...	12.5	1 u	β
1892.10	42.8	32.21	...	14.7	2 u	β
1899.05	43.0	32.28	...	12	1 u	β

AB and C (Σ 1097)

1832.15	312.1	20.20	6.5...	8.7	2u	Σ
1847.23	313.3	20.01	...	...	1u	Ma
1868.63	312.8	20.00	6.0...	8.9	4u	J
1878.16	313.5	20.21	...	...	1u	β
1880.21	312.7	20.02	...	8.9	4u	Sp
1887.15	314.5	20.66	...	8.9	6u	T
1892.04	312.7	19.88	...	9.0	3u	β
1899.05	313.4	19.84	...	10.0	1u	β

The duplicity of the principal star of Σ 1097 was discovered with the 6-inch. It was suspected by J when measuring the Σ star in 1865. Thus far there is no certain change in the close pair. The small star D is mentioned by H in his *Second Catalogue*. All the measures of the small stars and the Σ companion are given above. The latter is certainly fixed. The 18½-inch shows a faint star about $12''$ from C in the direction of 305° .

The principal star (B.A.C. 2470 = Lalande 14551) is a naked-eye star; ARGELANDER and HEIS 6 m, and placed in *Monoceros*. This star is variable 6.1 to 6.8 in about 14 days; discovered by ESPIN in 1883 (*Mon. Not. XLIII*, 432) (*Observations* XI, 1623).

[β (X)... β (2002, 3111)... β (1)... β (*Pub. L. O. II*)... β (11)... β (11, II app.)...Cin 2 ...FABRICI (1850)...MACHIN (*Observations*...Herschel) (*Mem. R. A. S.* III, IX)...Radcliffe Obs., XXII...]

 β 1104. 03 *Geminae*R.A. $7^h 22^m 21^s$ t
Decl. $+28^\circ 10'$ λ

1893.88	289.5	13.91	5.5	14.5	3 ^u	β
1898.60	288.2	13.33	5.5	14.2	3 ^u	A
1899.32	288.8	13.23		13.8	1 ^u	β

Discovered with the 6-inch. The proper motion, from AUWERS, is $0''.14$ in the direction of 217° .

(δ 147.0) β (1447) β (1448) β (1449) ... Asker.

β 22. W⁺ VII. 68.

R.A. $7^h 25^m 30^s$ t
Decl. $+35^\circ 7'$

1875.32	149.5	6.48	8.0...	11.2	4 n	J
1880.03	151.7	6.14	8.2...	10.4	4 n	β
1885.31	150.4	6.42	8.3...	10.0	3 n	β

Discovered with the 6-inch. Fixed.

(δ 111) β (Mon. Abt. XXXII, 151) β (1048) β (Pub. I. C. 111).

β 579. W⁺ VII. 726.

R.A. $7^h 20^m 40^s$ t
Decl. $+33^\circ 23'$

A and B

1878.24	249.4	1.84	7.2...	11.5	1 n	β
1886.31	249.6	1.77	...	...	1 n	H Σ
1890.09	253.0	0.90	7.9...	10.0	3 n	β
1895.24	244.2	1.12	...	...	1 n	D
1895.24	230.0	1.07	...	...	1 n	L

A and C (= O Σ 173.609)

1843.27	234.1	18.06	...	...	4 n	M α
1860.19	233.0	18.23	...	12.0	1 n	J
1860.19	232.0	18.94	...	10.9	2 n	β
1886.31	233.0	19.23	...	...	1 n	H Σ
1890.19	233.1	18.52	...	...	2 n	D
1895.24	231.7	16.72	...	...	1 n	L
1895.24	234.6	18.94	...	11.5	4 n	β

A and D

1867.90	347.1	43.06	...	9.0	3 n	J
1870.19	349.7	43.06	...	8.5	1 n	β
1880.24	347.1	43.43	...	...	1 n	H Σ
1895.24	347.7	43.44	...	...	2 n	D
1895.24	346.7	43.80	...	10.0	1 n	β

The duplicity of the principal star of O Σ 173 *ref.* was suspected with the 6-inch in 1875, and verified subsequently with the 18½-inch. The O Σ pair was referred to the second column of the *Publication*

Catalogue by reason of the distance of the companions. All the measures of these stars are given.

(δ 83) β (δ 130981) β (Pub. I. C. 111) ... J (p. 157)
... Doolittle (Pub. Flower Obs. 1) ... Lewis (Mon. Not. R.A.S., 400) ... Madler (Dorpat Obs. XI) ...]

β 200. 70 Geminorum

R.A. $7^h 30^m 40^s$ t
Decl. $+35^\circ 10'$

C and D

1876.02	241.8	1.49	10.0...	11.0	2 n	J
1880.11	241.8	1.42	9.0...	10.0	3 n	β
1892.06	242.2	1.74	9.3...	10.1	3 n	β
1898.96	244.2	1.82	9.5...	11.5	1 n	β

C and E

1880.09	206.6	17.20	...	13.0	1 n	β
1892.10	203.3	17.48	...	13.5	2 n	β
1898.96	207.2	17.74	...	13.0	1 n	β

A and B (= H⁺ VI. 701)

1876.78	190.0	98.43	...	11.0	1 n	J
1892.04	190.0	98.94	...	10.2	2 n	β
1898.79	190.0	99.23	...	10.5	2 n	β

A and C

1876.02	98.7	162.02	5.0...	...	2 n	J
1880.15	100.7	160.47	...	...	2 n	β
1892.04	98.5	161.46	...	...	2 n	β
1898.79	98.8	160.66	...	9.7	2 n	β

The distant stars, B and C, were noted by H⁺, and given without measures. The duplicity of C was discovered with the 6-inch. The above are all the measures of the several companions. AUWERS gives the proper motion of A $0''.029$ in the direction of $35^\circ 5'$.

(δ 111) β (Mon. Abt. XXXIV, 321) ... β ... β (111) ... β (Pub. I. O. n) ... d (1) ...]

β 201. Lalande 11945

R.A. $7^h 33^m 42^s$ t
Decl. $+29^\circ 6'$

1876.41	335.9	2.89	8.6...	8.5	3 n	J
1878.05	329.6	2.82	7.4...	8.6	2 n	Cin
1880.16	330.8	2.79	7.0...	8.0	1 n	Cin

1883.14	330.7	3.21	8.0	..	8.3	2 <i>m</i>	W
1886.20	331.0	2.80	7.0	...	8.0	1 <i>m</i>	LM
1889.02	331.1	2.84	7.8	...	8.1	3 <i>m</i>	Lv
1898.10	332.9	2.78	7	...	8	2 <i>m</i>	Sc
1898.16	332.6	3.46	...	...	...	1 <i>m</i>	See

Discovered with the 6-inch. Evidently fixed.

[β (iv)... β (*Men. Not.* XXXIV, 382)... Δ (1)...Cin⁵...Cin⁶
...Wilson (Cin¹⁰)...LM...Lv...Scott (*Men. Not.* LIX,
427)...See ()...]

β 1061. κ Argus

R.A. 7^h 33^m 54^s 1
Decl. — 26° 32' 1"

B and C

1889.12	229.3	6.46	...	13.8	3 <i>m</i>	β
1898.27	228.6	6.25	...	...	1 <i>m</i>	See
1898.27	228.0	6.87	4	...	14.5	2 <i>m</i> A

A and B (— H⁺ III. 27)

1826.5	315.8	8.76	6.12	...	6.12	Dunlop
1836.67	317.8	10.41	5	...	5	3 <i>m</i> H ⁺
1878.20	318.4	9.96	5.0	...	5.0	1 <i>m</i> Cin
1882.10	318.2	10.13	4.3	...	4.7	2 <i>m</i> Wilson
1889.12	318.5	9.98	4.1	...	4.1	3 <i>m</i> β
1898.27	318.1	9.72	4+	...	4+	2 <i>m</i> A

The minute star was discovered with the 36-inch. The bright star has no sensible proper motion.

[β (xv)... β (2929)... β (*Pub. I.* O. II)...See ()...Atken ()...]

The bright stars which make H⁺ III. 27 appear to be relatively fixed. Some of the measures are given. All will be found in the following:

[Dunlop (*Mem. R. A. S.* III)...Herschel (*Cape Obs.*)...Powell (*Mem. R. A. S.* xxv)...Jacob (*Mem. R. A. S.* xvii)...Worster and Jacob (*Madras Obs.* 2d Series)...Secchi (*Catalogo di 1721 Stelle Doppie* 1866)...Poncia (*Annuaire Linceo*, Anno VIII)...Kadiatch (*Obs.* XXIII)...Cin...Wilson (Cin¹⁰)...]

β 580. β Geminorum (Pollux)

R.A. 7^h 37^m 38^s 1
Decl. — 28° 15' 1"

C and D

1878.10	128.0	1.40	10	...	12.5	2 <i>m</i> β
1889.14	130.9	1.14	9.5	...	12.5	1 <i>m</i> β

1892.14	130.6	1.14	10	...	11.5	3 <i>m</i> β
1898.89	131.2	1.27	10.0	...	13.0	1 <i>m</i> A
1899.22	140.7	1.02	9.7	...	11.5	1 <i>m</i> β

A and B

1880.22	275.3	41.39	2	...	13.5	1 <i>m</i> β
1892.14	277.6	34.10	...	...	14.3	3 <i>m</i> β
1898.88	280.0	30.22	...	...	15.0	2 <i>m</i> A
1898.96	278.1	30.88	...	...	15.0	1 <i>m</i> β

A and C (= H⁺ VI. 42 = S 559)

1781.90	65.5	116.75	...	...	1 <i>m</i> H ⁺
1825.10	66.4	132.3	...	...	2 <i>m</i> S
1878.73	71.0	174.61	...	...	2 <i>m</i> β
1884.27	71.1	176.98	...	...	1 <i>m</i> H Σ
1898.81	71.7	187.57	...	...	1 <i>m</i> β
1898.87	71.8	187.72	...	...	1 <i>m</i> A

A and E

1877.08	90.4	205.5	...	...	1 <i>m</i> Film
1879.24	90.0	206.30	...	...	1 <i>m</i> β
1898.81	90.0	218.54	...	...	1 <i>m</i> β
1898.87	90.0	219.10	...	...	1 <i>m</i> A

A and F (— Σ 5 App. II)

1781.90	74.1	160.70	...	...	1 <i>m</i> H
1825.10	74.7	168.47	...	...	2 <i>m</i> S
1830.20	73.9	203.84	2.0	...	3 <i>m</i> Σ
1850.71	74.4	213.28	...	...	2 <i>m</i> O Σ
1867.52	75.1	223.41	...	...	1 <i>m</i> J
1879.24	75.3	229.24	...	...	1 <i>m</i> β
1884.21	75.6	233.15	...	...	2 <i>m</i> H Σ
1898.81	76.3	242.87	...	...	1 <i>m</i> β
1898.87	75.8	242.57	...	...	1 <i>m</i> A

C and E

1851.88	89.8	57.40	3 <i>m</i> O Σ
1884.10	89.5	57.98	1 <i>m</i> H Σ
1898.96	89.4	58.31	1 <i>m</i> β

C and I

1898.96	145.2	21.12	1 <i>m</i> β
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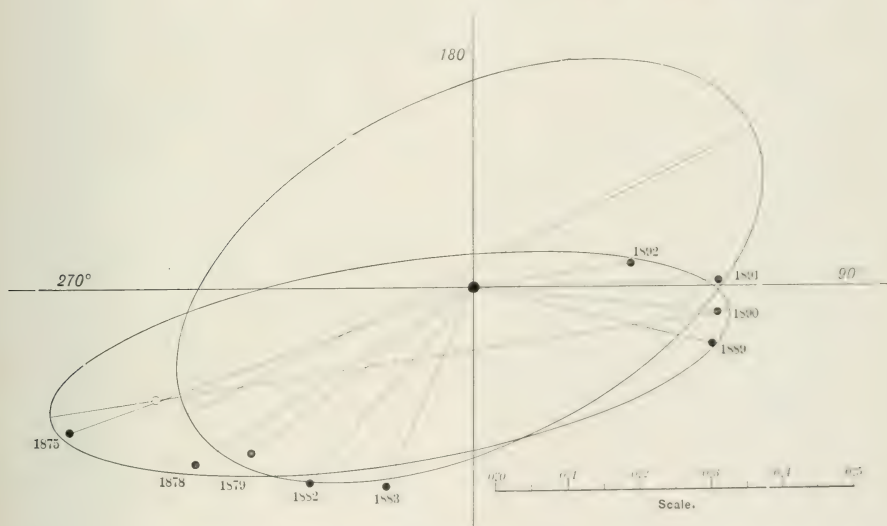
The duplicity of Herschel's distant companion to Pollux was discovered with the 18-inch. The nearest star, B, was found with the same instrument. The measures show no sensible motion in O.D. β

Discovered with the 6-inch. One of the most interesting of the rapid binaries from its short period, and the proper motion of the system.

Four orbits have been found for this pair, using the measures to the dates given :

1892	Glazenapp	40.54 years	<i>Mon. Not.</i> LII. 546
1892	Burnham	23.3 years	<i>Pub. L.O.</i> II. 239
1892	Glazenapp	23.33 years	<i>Mon. Not.</i> LIV. 318
1895	See	22.00 years	<i>A. N.</i> 3297

be substantially correct by the measures of BARNARD in 1894 (*Ast. and A.-P.* XIII. 290) and subsequent observations. GLASENAPP'S second orbit is from this apparent ellipse, and of course gives the same elements. So far this ellipse appears to satisfy the observations as well as could be desired, and any improvement in the period and other elements can only come when a considerable portion of the second revolution has taken place, particularly on the following side where the angular



9 Argus. β 101.

The first three are based upon the same measures, but GLASENAPP allowed an error much too great in the distance given in my measures in 1892. I called attention to this (*Astronomy and Astro-Physics*, XII. 494), and gave another orbit, which satisfied this as well as the prior measures, and predicted a change in the position-angle of more than 180° in the two years following the measures of 1892, thus completing nearly one entire revolution since the first measures. This orbit was shown to

change is rapid. These orbits are shown in the accompanying diagram, reproduced from *Publications of the Lick Observatory*, Vol. II :

This system has a considerable proper motion

Auwers	—	—	33.00	188.4
Porter	—	—	34.30	194.3

It was evident at the beginning, before it was measured at all, that this was a binary, as otherwise

β 202. O. Arg. S. 7850

R.A. 7^h 56^m 50^s *t*
Decl. 26° 54' *t*

A and B

1876.09	164.8	8.18	7.5...	6.0	1 ⁿ	β
1878.16	160.4	7.74	7.0...	9.7	2 ⁿ	Cin
1883.11	164.4	...	7.5...	10.0	1 ⁿ	W
1892.10	160.7	7.77	7.2...	10.0	3 ⁿ	β
1892.19	160.3	7.62	7.3...	10.4	3 ⁿ	Lv
1897.85	160.8	7.30	6...	11.5	1 ⁿ	See
1899.09	161.2	7.60	8.0...	11.0	1 ⁿ	β

A and C

1897.85	77.1	19.37	...	13.6	1 ⁿ	See
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A and D

1897.85	239.2	29.43	...	12	1 ⁿ	See
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Discovered with the 6-inch. Probably fixed.

[β (IV)...β (*Mon. Not.* XXXIV, 382)...β (3414)...β (*Pub. L. O.* II)...Cin³...Cin⁴...Wilson (Cin¹⁰)...Lv (*Proc. Haverford Coll. Obs.*, 1892) (*A. J.* 278)...See (3495)...]

β 203. O. Arg. S. 7874

R.A. 7^h 57^m 41^s *t*
Decl. 27° 13' *t*

1876.11	242.5	7.15	7.7...	8.5	7 ⁿ	Cin
1879.09	243.8	6.94	7.0...	8.5	1 ⁿ	Cin
1883.11	245.2	7.15	7.0...	9.0	1 ⁿ	W
1898.14	242.2	7.41	...	...	1 ⁿ	See

Discovered with the 6-inch. No sensible change.
A 9 m star 64" distant in 73²7.

[β (IV)...β (*Mon. Not.* XXXIV, 382)...Cin³...Cin⁵...Wilson (Cin⁷)...See ()...]

β 581. Latande 45743

R.A. 7^h 57^m 41^s *t*
Decl. 27° 13' *t*

A and B

1878.15	170.9	0.4	8...	8...	2 ⁿ	β
1878.22	180.3	0.40	8.7...	8.7	1 ⁿ	J

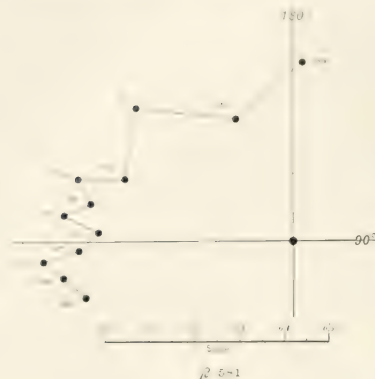
1883.37	205.2	0.55	...	...	3 ⁿ	Lv
1886.26	229.6	0.49	...	...	2 ⁿ	HΣ
1889.23	249.8	0.4	...	...	1 ⁿ	Sp
1890.21	253.7	0.5±	...	...	1 ⁿ	Sp
1891.97	259.4	0.46	...	...	4 ⁿ	β
1893.24	263.2	0.51	...	...	1 ⁿ	Sp
1893.31	273.1	0.84	...	...	1 ⁿ	Lew
1893.93	266.0	0.55	...	...	1 ⁿ	Bar
1894.17	262.3	0.56	...	...	4 ⁿ	HΣ
1894.27	266.8	0.47	...	...	4 ⁿ	Sp
1895.22	267.9	0.43	...	...	3 ⁿ	Sp
1895.24	266.8	0.50	...	...	1 ⁿ	HΣ
1895.28	278.3	0.45	...	...	1 ⁿ	Lew
1895.28	274.0	0.34	...	...	3 ⁿ	Com
1896.18	272.8	0.59	...	...	3 ⁿ	Lew
1896.24	272.9	0.37	...	...	3 ⁿ	Com
1896.94	274.9	0.56	...	...	3 ⁿ	A
1897.81	275.5	0.56	...	...	1 ⁿ	β
1898.16	271.0	0.35	...	...	1 ⁿ	How
1898.18	282.0	0.50	...	...	3 ⁿ	Br
1898.25	281.4	0.49	...	...	1 ⁿ	Lew
1898.27	278.0	0.45	...	...	1 ⁿ	Sp
1899.16	285.1	0.48	8.2...	8.2	2 ⁿ	A

AB and C

1878.13	185.3	4.76	...	...	3 ⁿ	β
1878.22	184.3	4.76	...	...	1 ⁿ	J
1886.25	189.5	4.36	...	...	1 ⁿ	HΣ
1891.97	192.7	4.60	...	...	4 ⁿ	β
1892.13	190.8	...	...	...	1 ⁿ	Com
1894.17	191.6	4.58	...	...	4 ⁿ	HΣ
1895.24	192.3	4.60	...	...	1 ⁿ	HΣ
1895.28	190.3	4.82	...	...	1 ⁿ	Lew
1896.18	197.0	5.13	...	...	3 ⁿ	Lew
1896.94	196.7	4.42	...	...	2 ⁿ	A
1897.81	193.3	4.50	...	...	1 ⁿ	β
1898.18	195.9	4.55	...	...	1 ⁿ	Br
1898.25	231.7	4.79	...	...	1 ⁿ	Lew
1899.02	192.5	4.53	...	...	1 ⁿ	β
1899.16	194.1	4.73	...	...	2 ⁿ	A

This most interesting triple system was discovered with the 18-inch. The change in the rapid direct angular motion, with no sensible change in the distance. The third star, C, is also moving in the same direction more slowly. This system bears a close resemblance, in all respects, to ζ *Cancri*, except as to the magnitudes of the com-

ponents. The principal positions of the close pair are shown in the following diagram:



The proper motion of this star, if any, is not large. PORTER finds, from an examination of the meridian observations, that an annual proper motion of $0''.12$ in the direction of 180° would best represent them, but from the lack of observations this value is not certain. Whatever the movement may be, it is evidently common to the three components.

[β (x)... β^1 ... β (3114)... β (Ant. & A-P. XIII, 17)... β (Pub. L. O. II)... β (Cin⁵...Lewis (Mon. Not. LIX, 400)...Madler (Fixstern-Systeme II)...Engelmann (Mess. Neunzig Doppelsternen)...Bigourdan (Paris Obs. 1883)...Pritchett (Pub. Morrison Obs. I)...]

A and B (Σ 1179)

1829.73	205.2	17.91	8.5...	8.5	2 ⁿ	Σ
1847.23	204.3	18.38	...	...	1 ⁿ	Ma
1863.18	205.0	20.71	...	...	1 ⁿ	En
1864.90	204.6	19.16	8.6...	8.6	5 ⁿ	J
1878.09	204.5	19.75	...	...	2 ⁿ	β
1879.28	204.8	19.86	8.8...	8.8	1 ⁿ	Cin
1880.18	203.5	19.52	...	...	2 ⁿ	Pl
1881.18	203.8	19.73	...	...	1 ⁿ	Big
1891.09	204.2	19.93	8.7...	8.7	3 ⁿ	β
1896.14	204.8	20.43	...	...	1 ⁿ	Lew
1899.02	203.9	20.26	8.3...	8.3	1 ⁿ	β

The small companion to B of Σ 1179 was discovered with the $18\frac{1}{2}$ -inch. The change in AB is due to proper motion, probably of the brighter component. This movement appears to be about $0''.03$ in a direction nearly opposite B. All the measures of these stars are given above.

[β (x)... β^1 ... β (3114)... β (Ant. & A-P. XIII, 17)... β (Pub. L. O. II)... β (Cin⁵...Lewis (Mon. Not. LIX, 400)...Madler (Fixstern-Systeme II)...Engelmann (Mess. Neunzig Doppelsternen)...Bigourdan (Paris Obs. 1883)...Pritchett (Pub. Morrison Obs. I)...]

β 903. Lalande 15768

R.A. $7^h 58^m 0^s$
Decl. $-1^\circ 41' 5''$

1879.27	28.2	1.48	8.3...	9.5	1 ⁿ	Cin
1879.60	33.7	1.47	7.8...	9.3	5 ⁿ	β
1892.11	32.8	1.54	8.2...	9.0	3 ⁿ	β

Discovered with the $18\frac{1}{2}$ -inch. Unchanged.

[β (XIII)... β^1 ... β (3114)... β (Pub. L. O. II)...Cin⁵...]

β 334. Lalande 15933

R.A. $8^h 20^m 3^s$
Decl. $-21^\circ 42' 5''$

1877.14	352.4	2.38	8.0...	8.7	2 ⁿ	Cin
1880.18	354.2	...	...	...	1 ⁿ	Cin
1894.23	352.3	2.55	8.1...	9	1 ⁿ	Sel
1897.83	352.5	2.90	7.1...	8.1	1 ⁿ	See

Discovered with the 6-inch. Apparently fixed.

[β (vi)... β (2062)...Cin⁴...Cin⁵...Sellors (3303)...See Catalogue I]

β 582. Lalande 11211760

R.A. $2^h 58^m 0^s$
Decl. $-1^\circ 12' 0''$

1878.09	59.8	3.76	12	2 ⁿ	β
1880.18	59.8	3.76	11	1 ⁿ	Cin
1894.23	59.8	3.76	11.2	2 ⁿ	β
1896.14	58.0	4.39	10	1 ⁿ	Lew
1899.02	55.1	3.59	20	1 ⁿ	β

β 576. Lalande 16300

R.A. $8^h 13^m 50^s$ $\frac{1}{2}$
Decl. $+ 34^\circ 19'$

1878.05	143.1	1.48	7	...	13	1 h	β
1899.02	147.9	1.37	7	...	13	1 h	β

Discovered with the $18\frac{1}{2}$ -inch. By a clerical mistake, the place of this star was given in β (x) with an error of 1^h in R.A. and 1° in Decl., as appears from the record made at the time of discovery. The correct place is given above.

[β (x)... β (...)]

 β 907. S.D. (12) 2462

R.A. $8^h 14^m 4^s$ $\frac{1}{2}$
Decl. $- 12^\circ 27'$

1879.74	57.8	0.82	8.5	...	10.7	2 h	β
1892.18	55.2	0.88	8.7	...	9.7	3 h	β
1899.26	52.1	0.82	9.0	...	9.4	1 h	β

This close pair of small stars is 11^s β and 99^s η of a 7 m star. Discovered with the $18\frac{1}{2}$ -inch.

[β (xiii)... β (...)]

 β 1066. Lalande 16489

R.A. $8^h 18^m 31^s$ $\frac{1}{2}$
Decl. $+ 9^\circ 49'$

1889.12	187.7	2.25	6.8	...	13.2	3 h	β
1898.96	185.5	2.28	7.0	...	13.0	1 h	β

Discovered with the 36-inch. The magnitude in D.M. is 7.6.

[β (xv)... β (2920)... β (Pub. I, O. 11)]

 β 1067. α Ursae Majoris

R.A. $8^h 26^m 17^s$ $\frac{1}{2}$
Decl. $+ 61^\circ 7'$

1889.22	191.1	7.01	3.5	...	15.2	3 h	β
1892.12		Not seen with 36-in.				2 h	β
1895.09	194.4	7.15				2 h	Bat
1899.17	192.3	7.15			15.5	1 h	A

Discovered with the 36-inch. The large star has a proper motion of 0.170 in the direction of 229° S

(AUWERS). There is no doubt of this being a physical system, as the small star is moving exactly with the other. If it was fixed in space, the position-angle would decrease 11° and the distance 1.27 in the interval between 1889 and 1899. It is evident from the measures that there has been no sensible change.

ENGELHARDT (*Obs. Ast.*, II, III) measures two distant stars in the field:

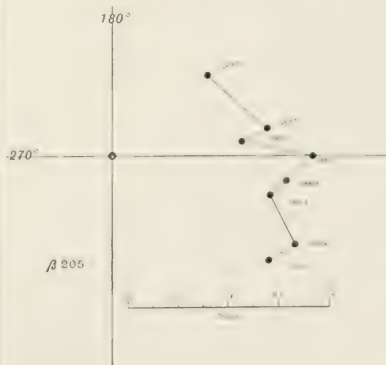
1888.30	152.5	143.70	2 h
1894.27	152.1	144.05	2 h
1888.30	208.0	177.23	2 h
1894.27	208.0	175.95	2 h

[β (xv)... β (2920, 3141)... β (Pub. I, O. 11)] Barnard & L. J. 4471. ... Atken ()]

 β 205. O. Arg. S. 8685

R.A. $8^h 27^m 54^s$ $\frac{1}{2}$
Decl. $- 24^\circ 12'$

1874.19	310.7	0.5+	7	...	7	β
1877.11	280.9	1.00	7.0	...	7.2	1 h CII
1878.53	100.3	0.63	6.9	...	7.3	1 h CII
1882.21	276.6	0.52	7.0	...	7.0	3 h Sp
1886.17	270.1	0.80	8.5	...	7.7	2 h W
1889.16	257.0	0.74	7.0	...	7.2	1 h 1 h



1800.00	200.00	0.70	7.5...	7.5	200	β
1801.87	256.2	0.65	7.2...	7.5	300	β
1802.00	255.00	0.50		7.0	300	See
1807.47	244.4	0.55		7.0	300	Alt
1808.10	244.3	0.75		7.0	300	See
1808.25	236.5	0.75	7.7...	7.5	300	Alt

Discovered with the 6-inch. The change in angle is a little more than 2° per year, with perhaps a small increase in the distance, but the measures are not very accordant. The Cordoba magnitude is 6.4. Lacaille 3377. See measures a 14.5-m star, $354^\circ 5' : 26^\circ 44' (1898.16) 1m$.

The principal positions are shown in the accompanying diagram.

[3100]... β (Mon. Not. XXXIV, 280)... β (Mon. Not. XXXIV, 280)...
L. O. H. ... Cin³... Cin³... Wilson (Cin³)... Sp (II)...
Lvt... Sellors (3240)... Aitken (3465)... See ()...
Aitken ()...]

β 206. Cord. G. C. 14303

R.A. $8^h 10^m 17.7$
Decl. $-22^\circ 40' 3''$

1874.10	278.6	1.5	8.0...	7	1m	β
1875.11	281.7	1.40	8.0...	8.7	2m	Cin
1880.27	279.5	1.62	8.0...	8.7	1m	Pt
1886.21	285.2	1.8	8.0...	9	1m	LM
1889.09	280.3	1.76	8.0...	8.4	3m	Lv
1898.19	280.2	1.93	8.0...	8.4	1m	See

Discovered with the 6-inch. Probably unchanged.

[3101]... β (Mon. Not. XXXIV, 352)... Cin³... LM...
[1000] (Mon. Not. XXXIV, 280)... See ()...]

β 584. Lacaille 17094

R.A. $8^h 10^m 17.7$
Decl. $-22^\circ 40' 3''$

A and B

1874.10	278.6	1.5	8.0...	7	1m	β
1875.11	281.7	1.40	8.0...	8.7	2m	β

A and C (S 571)

1875.13	157.00	45.04	7.12...	8	2m	S
1875.47	156.3	45.12	7.0...	7.3	3m	J
1879.49	159.3	44.70	7.0...	7.0	3m	Sch
1892.85	156.2	44.80	7.0...	7.0	3m	β
1899.77	159.7	45.04	7.0...	7.0	2m	β

A and D

1875.13	244.35	92.26	7.0...	9	2m	S
1875.47	244.2	92.76	7.0...	6.3	3m	J
1879.49	244.4	92.26	7.0...	7.0	2m	Sch
1899.07	241.6	92.85	7.0...	7.0	2m	β

D and C

1875.07	87.9	99.72	7.0...	7.0	3m	J
1879.65	87.8	99.69	7.0...	7.0	3m	Sch

The close attendant to this wide triple in *Praesepe* was discovered with the $18\frac{1}{2}$ -inch. The bright stars make S 571=O Σ (App.) 95. Each of the three bright stars has a slightly different proper motion, according to REICHENBERG (A. N. 3482). He gives the movement of A as $0''.114$ in the direction of $262^\circ 4'$. It is evident, if this star has any such annual change, that B is moving with it, as otherwise the change in A from 1878 to 1892 would amount to $1''.6$.

[3101]... β (Mon. Not. XXXIV, 280)... β (Mon. Not. XXXIV, 280)...
Radcliffe Obs. XXIII... Schur (2255)...]

β 207. Lacaille 17094

R.A. $8^h 10^m 17.7$
Decl. $-22^\circ 40' 3''$

1876.08	103.6	4.32	6.5...	10.5	3m	J
1877.10	106.1	4.54	6.7...	9.2	2m	Cin
1880.71	102.2	4.48	7.1...	9.5	2m	β
1888.65	102.8	4.60	7.0...	10.2	2m	LA
1893.20	101.6	4.84	7.2...	10.5	2m	J
1898.21	101.6	4.17	7.0...	10.5	1m	See

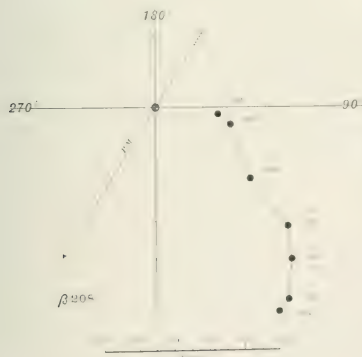
Discovered with the 6-inch. Without change. The larger star is red.

[3101]... β (Mon. Not. XXXIV, 280)... β (Mon. Not. XXXIV, 280)...
Lvt... Jones (A. J. 312)... See ()...]

β 208. *Lacuse 1713*R.A. $8^h 12^m 33.9^s$
Decl. $-22^{\circ} 35' 33''$

1874.16	35.4	1.4	6.0...	9.0	1 st	β
1877.13	31.7	1.71	6.0...	9.0	1 st	Cin
1878.43	33.9	1.37	6.0...	8.0	5 th	Cin
1882.21	40.0	1.21	6.0...	10.0	3 rd	Sp
1886.18	43.2	1.27	6.0...	8.0	1 st	W
1889.13	47.5	1.06	7.0...	8.0	2 nd	β
1892.11	52.3	0.70	6.8...	8.1	3 rd	β
1894.26	47.0	0.57			1 st	Com
1895.32	55.5	0.6±			1 st	Com
1897.83	74.7	0.39	6.2...	6.4	1 st	See
1898.29	76.2	0.45	6.3...	8.2	2 nd	A
1899.19	83.2	0.36	6.5...	8.0	1 st	A

Discovered with the 6-inch. It appears to be a most interesting system from the rapid relative change and from the large proper motion. PORTER gives this movement in space as 0.483 in the direction of 328°3. Rapid motion in angle may be expected with the close approach of the two components. The principal positions are shown in the accompanying diagram.



This is a naked-eye star in *Argo*; Cord. G. C. 5.6 m.

[*See β 208* V. 8, p. 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000]

β 585. *W. V. 111. 81*R.A. $8^h 45^m 22.9^s$
Decl. $-5^{\circ} 39' 43''$

1878.11	110.3	0.45	7.5...	8.0	1 st	β
1880.23	110.4	0.50			2 nd	HΣ
1889.72	110.3	0.46			1 st	Sp
1893.72	110.3	0.43			2 nd	Sp

Discovered with the 18½-inch. One of the outlying stars of *Praesepe*. B.A.C. 2927. Magnitude in D.M. 7.0.

[*See β 585* V. 8, p. 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000]

β 209. *W. V. 111. 81*R.A. $8^h 45^m 22.9^s$
Decl. $-5^{\circ} 39' 43''$

1875.77	355.4	1.56	8.4...	8.7	4 th	J
1878.75	357.0	1.57	8.0...	8.7	4 th	Sp
1881.28	357.7	1.43			1 st	Pt

Discovered with the 6-inch. Later measures are needed, but so far there is no evidence of change.

[*See β 209* V. 8, p. 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 25

β 24. Lalande 17886

R.A. 8^h 48^m 24^s *t*
Decl. - 8° 18' *λ*

1875.15	171.9	1.03	7.9...	9.0	3 <i>m</i>	J
1878.19	177.3	1.12	7.8...	9.0	1 <i>m</i>	β
1878.88	175.0	1.08	7.3...	8.3	3 <i>m</i>	Cin
1886.84	173.5	1.26	...	...	1 <i>m</i>	LM
1888.91	173.8	1.19	7.5...	8.4	4 <i>m</i>	LV
1890.22	170.5	1.23	...	...	3 <i>m</i>	T
1892.13	174.7	1.02	7.5...	8.0	1 <i>m</i>	Col
1892.93	172.2	0.95	7.5...	8.0	1 <i>m</i>	J
1893.22	177.4	1.06	8.0...	8.7	2 <i>m</i>	J

Discovered with the 6 inch. No evidence of motion.

[β (i)...β (*Mon. Not.* XXXIII, 351)...d (i)...Cin⁵...LM...
Lv⁵...Tarrant (3186)...Jones and Collins (*Proc. Haverford Coll. Obsv.* 1892) (*A. J.* 212, 278)...]

β 408. Radcliffe 2231

R.A. 8^h 48^m 55^s *t*
Decl. + 63° 53' *λ*

1877.80	344.0	2.94	7.8...	10.3	3 <i>m</i>	J
1879.35	346.7	2.94	7.0...	9.5	1 <i>m</i>	OΣ
1883.64	345.7	3.50	7.3...	10.2	5 <i>m</i>	En
1886.35	342.3	3.01	...	...	2 <i>m</i>	HΣ
1898.15	340.6	3.34	7.0...	10	4 <i>m</i>	D

Discovered with the 6-inch. Probably no change.

[β (VII)...β (2103)...d (i)...Engelmann (2678)...OΣ (*Poudkova Obsv.* X)...HΣ ()...Doolittle (*Pub. Flower Obsv.* 1)...]

β 103. Lalande 17611

R.A. 8^h 49^m 2^s *t*
Decl. - 7° 22' *λ*

1875.08	73.9	2.90	8.0...	11.2	2 <i>m</i>	J
1879.52	73.9	2.86	7.9...	10.8	3 <i>m</i>	β
1880.76	73.7	2.71	...	...	1 <i>m</i>	Pi
1885.14	69.7	2.77	8.5...	10.7	1 <i>m</i>	W
1898.20	71.0	3.11	8.0...	10	3 <i>m</i>	D

Discovered with the 6-inch. So far relatively fixed.

[β (ii)...β (*Mon. Not.* XXXII, 437)...β¹...d (i)...Wilson (Cin⁶)...Pritchett (*Proc. Mount Wilson Obsv.* 1)...Doolittle (*Pub. Flower Obsv.* 1)...]

β 210. Lalande 17696

R.A. 8^h 51^m 18^s *t*
Decl. - 10° 38' *λ*

1875.48	181.6	2.40	7.0...	7.4	3 <i>m</i>	J
1876.12	183.2	2.80	7.7...	7.5	6 <i>m</i>	Cin
1878.18	181.6	2.62	7.8...	7.5	1 <i>m</i>	Cin
1879.25	181.0	2.54	6.8...	6.5	2 <i>m</i>	Cin
1882.21	183.1	2.62	7.0...	7.4	2 <i>m</i>	Sp
1882.45	181.3	2.64	7.8...	7.6	3 <i>m</i>	W
1886.85	183.3	2.76	7.7...	7.0	3 <i>m</i>	LM
1893.20	183.0	2.66	6.8...	6.8	2 <i>m</i>	J
1893.22	182.6	2.67	7.7...	7.7	1 <i>m</i>	Se
1898.09	183.5	2.36	6.1...	6.1	3 <i>m</i>	Se
1898.16	183.5	2.96	...	...	1 <i>m</i>	See

Discovered with the 6-inch. Evidently fixed.

[β (iv)...β (*Mon. Not.* XXXIV, 382)...d (i)...Cin¹...Cin⁵...Wilson (Cin⁶)...LM...Sp (ii)...Jones (*Id. J.* 312)...Sellars (3249)...Scott (*Mon. Not.* 1888, 1887)...See ()...]

β 409. Lalande 17812

R.A. 8^h 54^m 55^s *t*
Decl. - 8° 43' *λ*

1878.26	184.3	9.05	8.0...	10.5	1 <i>m</i>	J
1879.52	184.7	9.77	7.8...	10.6	3 <i>m</i>	β
1880.24	184.6	9.68	...	...	1 <i>m</i>	En
1884.01	185.6	9.94	7.5...	6.9	3 <i>m</i>	En
1899.07	184.1	9.66	7.7...	11.0	1 <i>m</i>	β

Discovered with the 6-inch. There is no indication of any change.

[β (VII)...β (2103)...β¹...J (i)...Pritchett (*Pub. Flower Obsv.* 1)...Engelmann (2678)...]

β 211. Hydra 68

R.A. 8^h 55^m 44^s *t*
Decl. - 3° 30' *λ*

1875.27	257.7	1.11	7.5...	10.0	2 <i>m</i>	J
1877.25	254.4	1.08	7.5...	9.8	1 <i>m</i>	OΣ
1879.27	261.9	1.08	7.0...	9.8	1 <i>m</i>	Cin
1886.30	260.0	1.40	...	...	2 <i>m</i>	HΣ
1888.51	262.0	1.05	7.1...	9.1	2 <i>m</i>	LV
1890.20	262.5	1.12	...	...	2 <i>m</i>	T
1892.25	264.3	1.02	...	...	2 <i>m</i>	Sp
1893.26	261.2	0.99	...	...	2 <i>m</i>	Sp

Discovered with the 6-inch. It is probably unchanged. Lalande (17811) brother star with Σ 123.

[β (iv)...β (2103)...β¹...J (i)...Pritchett (*Pub. Flower Obsv.* X)...Tarrant (3186)...Sp (iii)...HΣ ()...]

β 410. Lalande 18134

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1778.1	100.8	1.78	5.2	1.0	20	β
1860.12	100.0	1.69	5.3	1.0	20	β
1892.24	101.2	1.67	7.6	1.0	30	β
1893.0	101.3	1.63				See

Discovered with the 6-inch. Unchanged. In 1900 (L. 9) 7.00.

2000 (1900) 100.00... β (Pub. L. 100) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00...

 β 104. Lalande 18144

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1875.15	107.7	1.38	7.0	1.8	30	β
1875.47	111.0	2.95	7.0	1.00	10	Ω
1880.29	110.1	2.85			10	β
1880.31	106.8	1.47			10	Ω
1900.11	106.8	2.88	5.0	1.10	30	β
1899.09	104.5	1.70	5.0	1.10	10	β

Discovered with the 6-inch. Probably fixed.

2000 (1900) 100.00... β (Pub. L. 100) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00...

 β 336. Lalande 18231

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1876.17	238.2	1.93	8.7	1.1	30	β
1876.17	238.2	1.93	8.7	1.1	30	β
1880.12	238.2	1.93	8.7	1.1	30	β
1880.12	238.2	1.93	8.7	1.1	30	β

Discovered with the 6-inch. The change, if any, is very slow. Lalande 18231.

 β 908. S.D. 18231

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1880.26	234.0	0.82	0.2...	11.0	20	β
1894.21	235.7	0.74	0.2...	10.6	20	β

A and B

1880.22	184.6	0.820	0.0...	9.1	20	β
1894.21	184.3	0.828	8.6...		20	β
1899.11	184.3	0.828	8.5...	8.7	20	β

Discovered with the 18.5 inch. B is S.D. (7°) 2762. There is a 12.5 m star in the direction of 222° from A.

181800... β (3141)... β (Pub. L. 100) 100.00...

 β 455. Lalande 18231

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1875.30	65.2	1.94	9.5...	10.5	20	β
1888.05	70.3	1.93	8.2...	10.2	30	β
1898.20	69.5	1.81	8.4...		30	β

Discovered with the 6 inch. Change uncertain. Magnitude in L. 7.2... D.M. 8.1.

2000 (1900) 100.00... β (Pub. L. 100) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00...

 β 212. *Hydrus* 495

R.A. $9^{\text{h}} 57^{\text{m}} 41^{\text{s}}$
Decl. $-7^{\circ} 47' 30''$

1878.64	230.8	1.18	7.5...	8.2	20	β
1878.23	225.8	1.36	7.2...	7.7	40	β
1880.50	228.0	1.26	7.9...	8.2	40	β
1880.55	223.9	1.51	7.5...	8.3	30	β
1885.23	225.6	1.47	8.0...	8.5	10	β
1887.01	223.8	1.59	7.3...	8.6	10	β
1888.56	225.4	1.35	7.7...	7.9	30	β
1890.20	227.4	1.34	7.5...	1.00	30	β

Discovered with the 6 inch. The change, if any, is very slow. Lalande 18231.

2000 (1900) 100.00... β (Pub. L. 100) 100.00... 1892 (1900) 100.00... 1892 (1900) 100.00...

β 588. *Hydrus*.R.A. γ 180° 20' γ
Decl. $+$ 1 44' γ

1878.10	123.2	2.38	6.5	11	20	β
1892.05	125.1	2.45	7.1	11.2	30	β
1886.31	124.1	2.72			20	11 Σ
1899.09	129.4	2.43	7.6	100.2	20	β

Discovered with the 18 $\frac{1}{2}$ -inch. No sensible motion. Lalande 18302. In HEIS 6-7 m; D.M. 6.8.

[β (x)... β^* ... β (3141)... β (Pub. L. O. 10)...H Σ ()...]

 β 337. Lalande 18332R.A. δ 160° 54' δ
Decl. 17 23' δ

1876.17	320.8	7.70	7.0...	11.0	20	J
1877.13	326.3	8.00	7.2...	10.0	20	Cin
1892.19	322.8	7.83	7.0...	10.2	30	Lv
1898.29	325.5	8.16			10	See

Discovered with the 6-inch. Unchanged.

[β (vi)... β (2062)... δ (i)...Cin...Lv (A. J. 278) (Proc. Haverford Coll. Obs., 1892)...See ()...]

 β 338. Lalande 18338R.A. δ 170° 45' δ
Decl. 14 59' δ

1876.17	274.3	6.95	8.2...	10.0	20	J
1877.12	274.3	7.14	8.5...	9.5	20	Cin
1893.24	274.2	7.24	9.0...	10.5	20	J
1893.64	276.3	6.97	8.3...	10.2	30	W
1898.16	273.5	7.41			10	See
1899.09	274.2	6.78	8.3...	10.5	20	β

Discovered with the 6-inch. Without change.

[β (vi)... β (2062)... δ (i)...Cin...Jones (A. J. 112)...Wrightson ()...See ()...]

 β 105. κ *Leporis*R.A. γ 160° 30' γ
Decl. $+$ 30 32' γ

1876.20	213.8	3.15	4.9...	10.3	30	J
1877.75	208.8	3.22	5.3...	9.5	10	11 Σ

1878.33	203.8	2.88	5	11	20	11 Σ
1879.06	202.4	2.89	4.5	10.5	30	β
1881.30	205.0	3.00			30	11 Σ
1883.47	205.1	3.40	5.1	10.2	30	11 Σ
1886.23	202.2	3.37			10	11 Σ
1889.13	203.9	2.79	4.5	10.9	30	β
1898.27	203.3	2.96	4	11.3	30	A

Discovered with the 6 inch. A fine pair even with a small aperture. The measures thus far show no relative change. AUWERS gives the proper motion, 0".057 in the direction of 231.7. With this value, and the position of B in 1876, as found by J, the relation at the date of the last measure in 1898 should be, 187° : 2'0; so it is obvious that the companion has the same proper motion.

ENGELMANN suspected a star 11 m distant 10" in the direction of 65°. The 36-inch was not shown any other companion.

[β (ii)... β (Mon. Not. A.S.N., 1875)... β^* ... β (2062)... β (L. O. 11)... δ (i)...O Σ (Poulkova Obs., x)...Hall (i)...Pritchett (Pub. Morrison Obs., i)...Burton (Copernicus I, p. 54)...Engelmann (2678)...Aitken ()...H Σ ()...]

 β 1070. D.M. (20) 1040R.A. γ 180° 8' γ
Decl. $+$ 20 47' γ

1889.13	71.8	0.50	0.1	10.2	30	β
1898.15	74.6	0.34	1.2	10	10	A

This close pair of small stars, discovered with the 36 inch, is 27' J and 4.8 m at κ Lalande 18338. The magnitude in D.M. is 8.8.

[β (x)... β (2062)... δ (i)...Cin...Jones ()...]

 β 580. Lalande 18370R.A. γ 200° 10' γ
Decl. 30 32' γ

1878.08	211.6	0.20	7.8	10.3	10	β
1880.31	215.3	2.10			30	11 Σ
1891.06	218.0	3.33	1.2	11.3	30	11 Σ

Discovered with the 6-inch. Unchanged.

[β (i)... β (2062)... δ (i)...Cin...Jones ()...]

β 910. Lacaille 1883

R.A. $9^h 27^m 10^s$ ϵ
Decl. $-13^{\circ} 28' A$

1879.87	304.9	6.84	7.7...	10.2	30	β
1882.15	304.7	6.06	7.0...	9.5	10	W
1892.06	305.9	6.68	7.3...	10.7	30	β
1893.22	305.0	6.33	7.4...	10.4	20	J

Discovered with the $18\frac{1}{2}$ -inch. Probably fixed.

[β (XII)... β^1 ... β (3141)... β (796)... β (111)... Wilson (Cin)¹⁰]
...Jones (A.J. 312)...

β 214. Lacaille 16904

R.A. $9^h 38^m 52^s$ ϵ
Decl. $-17^{\circ} 56' A$

1875.28	261.1	3.09	7.2...	11.0	20	J
1877.11	259.2	2.92	7.5...	9.8	20	Cin
1886.29	261.3	3.21	8.0...	10.5	10	I.M.
1898.16	258.7	3.54	...	...	10	See
1898.25	256.5	3.21	7.6...	11.0	30	A

Discovered with the 6-inch. The motion, if any, is slow.

[β (IV)... β (Mon. Not. XXXIV, 382)... β (I)...Cin⁴...I.M...
See ()...Aitken ()...]

β 215. Lacaille 4058

R.A. $9^h 48^m 41^s$ ϵ
Decl. $-27^{\circ} 26' A$

1877.11	337.5	1.75	7.5...	9.0	10	Cin
1884.21	345.2	1.88	7.5...	9.5	20	W
1893.32	341.5	1.52	7...	11	10	Sci
1894.21	343.0	1.00	7.5...	9.8	20	W
1898.25	339.7	1.97	7.5...	11.3	30	A
1898.28	346.0	1.71	...	...	10	See

Discovered with the 6-inch. There is no evidence of motion.

[β (IV)... β (Mon. Not. XXXIV, 382)...Cin⁴...Wilson (Cin)¹⁰]
...Sellors (3240)...Wilson ()...Aitken ()...See ()...]

β 592. Arg. S. 1227

R.A. $9^h 48^m 10^s$ ϵ
Decl. $-15^{\circ} 28' A$

1878.22	191.8	9.80	6.5	12.5	20	β
1879.27	191.7	9.57	7.5	12.0	10	Cin
1879.82	191.6	9.86	6.6	11.7	30	β
1883.17	191.2	...	6.0	13.0	10	W
1893.28	193.0	9.95	...	...	10	See

Discovered with the $18\frac{1}{2}$ -inch. Fixed.

[β (X)... β^1 ... β^2 ...Cin⁴...Wilson (Cin)¹⁰...See ()...]

β 216. Lacaille 1274

R.A. $9^h 51^m 20^s$ ϵ
Decl. $-28^{\circ} 50' A$

1877.20	161.2	3.58	6.0...	11.2	20	Cin
1879.27	161.1	2.57	7.0...	12.0	10	Cin
1894.23	164.2	2.97	7.0...	11.5	10	W
1898.16	162.2	4.00	...	...	10	See
1899.02	160.2	3.37	6.5...	12.0	10	β

Discovered with the 6-inch. Probably fixed.

[β (IV)... β (Mon. Not. XXXIV, 382)...Cin⁴...Wilson (Cin)¹⁰]
()...See ()...]

β 1072. Lacaille 16989

R.A. $9^h 58^m 20^s$ ϵ
Decl. $-17^{\circ} 31' A$

A and B

1889.13	42.6	10.00	6.0...	12.5	30	β
1898.34	43.5	11.16	...	...	10	See
1899.04	43.9	10.04	...	...	20	β

A and C = Shell

1873.44	272.7	21.80	7.0...	7.5	10	Sci
1889.13	273.2	21.25	6.0...	7.1	30	β
1898.34	273.0	21.45	...	...	10	See
1899.04	273.8	20.84	7.0...	7.0	30	β

The faint companion to the principal star of H¹ N 25 (= Sh 100) was linked with the system. All the members of AC are 2nd or 3rd above. These stars appear to be fixed. They are Cord. G. C. 13732 and 13771.

[β (X)... β (Mon. Not. XXXIV, 382)...Cin⁴...Wilson (Cin)¹⁰]
()...See ()...]

β 593. λ Hydrae

R.A. $16^h 47^m 44^s$
Decl. $-11^{\circ} 46'$

1878.23	118.4	50.76	4	13.5	19	β
1892.10	118.8	53.58	4	13.3	30	β
1898.98	117.5	54.46		13.5	29	β

The faint companion was noted with the 18½-inch. The proper motion of λ Hydrae is given by AUWERS (*Fundamental Catalogue*) as $0''.227$ in the direction of $253^{\circ}.3$. This movement explains the change in the position of B.

[β (X)... β^s ... β (3142)... β (Pub. L. O. II)...]

β 25. W X. 242

R.A. $16^h 15^m 46^s$
Decl. $-9^{\circ} 10'$

1867.10	187.9	0.88			19	Hd
1872.76	185.1	1.81	8.6...	9.0	29	Du
1875.23	180.5	1.76	8.4...	9.0	49	J
1878.23	179.6	1.66	8.0...	9.0	29	Cin
1880.24	180.8	1.85			19	Pt
1881.19	180.9	1.78	8.1...	8.6	39	β
1886.30	178.9	1.06	8.0...	9.0	19	LM
1888.22	178.6	1.86	8.0...	8.8	29	LV
1890.22	176.5	1.79			39	T

Discovered with the 6-inch but it had been previously seen by SCHJELLERUP (A. N. 1485; *Catalogue of 10,000 Stars*, p. xxiv). The measures are discordant in angle, and there is probably no sensible motion.

[β (I)... β (Mon. Not. XXXIII, 351)... β^s ...*Annales Harvards Obs.* XIII)... β (I)...Dunér (*Measures Microm.* 1876)... Cin^s ...Pritchett (*Pub. Morrison Obs.* I)...LM...Lv...Tarrant (1886)...]

β 219. Hydra 214

R.A. $16^h 15^m 30^s$
Decl. $-21^{\circ} 38'$

1876.14	188.6	2.33	7.5...	9.2	59	Cin
1878.70	188.5	2.05	6.7...	8.7	19	Cin
1892.21	188.1	2.14	7.0...	9.3	49	LM
1892.26	186.4	2.07	7.0...	8.8	39	β
1898.16	187.7	2.77			19	See above.
1899.26	186.9	2.15	7.5...	8.3	39	β

Discovered with the 6-inch. Evidently fixed. The principal star is 6.5 m in Cord. G. C., No. 14126.

[β (X)... β^s ...*Mon. Not.* XXXIII, 351)... β (X)... β^s ...*Annales Harvards Obs.* XIII)... β (I)...Dunér (*Measures Microm.* 1876)... Cin^s ...Pritchett (*Pub. Morrison Obs.* I)...LM...Lv...Tarrant (1886)...]

β 912. W X. 253

R.A. $16^h 16^m 20^s$
Decl. $-18^{\circ} 49'$

1879.17	199.3	2.95	8.6...	11.6	29	β
1880.24	101.4		8.5...	11.2	19	Cin
1883.10	100.4		9.0...	12.0	29	W
1894.19	106.0	1.35	9.0...	11.8	25	W
1898.30	104.4	1.14	8.1...	10.6	19	A

Discovered with the 6-inch. Probably without change. The magnitude in S.D. is 8.7.

[β (XIII)... β^s ...Cin...Wilson (Cin²)...Wilson (Aitken (...))...]

β 1280. Hydra 2022

R.A. $16^h 16^m 30^s$
Decl. $+4^{\circ} 33'$

Band C

1892.06	1	9	11		β
1899.40	17.8	2.88	9.1...	11.7	A

A and B

1899.25	191.5	110.20	7.2	8.8	β
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An examination of my observing book at the L.O. shows that the small star of this wide pair was noted as double with the 36 inch on January 22, 1892, and estimated as given above. It was forgotten, and not subsequently examined. I have looked at it several times with the 40-inch, and on one occasion it had the appearance of being double. It must be a difficult object, and the distance is probably less than $1''$.

These stars are fixed and 8.2 in 1876; 11.0 positions for 1875 give 190.2 : 110° 50.

[Since the foregoing observations I have received from Aitken's (Munich) double pair (Munich) above.]

[Aitken (...)]

β 1281. Lacaille 20475

R.A. $10^h 11^m 18^s$
Decl. $-3^{\circ} 20' 5''$

1889.2 51.5 57 8.2 97 4^m β

This was discovered with the 40-inch in looking for the last preceding pair (β 1280). It is not difficult. According to Boss (*A.G.C.*) this star has a proper motion of $0''.149$ in the direction of $264^\circ 2$. The magnitude in D.M. is 7.5. It is certain to be a physical system, since the components must have a common proper motion.

 β 1073. *Sextantis* 101

R.A. $10^h 20^m 26^s$
Decl. $-27^{\circ} 3'$

1889.2 10.3 33.2 7.0 11.5 3^m β

1895.1 10.5 33.2 7.0...11.8 2^m A

Discovered with the 36-inch. No material change. Lacaille 20428. Magnitude in L $6\frac{1}{2}$; in S.D. 7.2.

[β (XV)... β (2020)... β (*Pub. L. O. II*)...Aitken ()...]

 β 1260. *Hydrae*

R.A. $10^h 28^m 18^s$
Decl. $-24^{\circ} 38' 3''$

1882.2 53.8 55.07 5 14 1^m β

1898.22 59.7 19.09 1^m See

1899.04 59.1 28.77 13.2 2^m β

Distant companion noted with the 36-inch. The principal star has a proper motion of $0''.047$ in the direction of 309.9 (AUWERS).

[β (III)... β (1441)... β (*Pub. L. O. II*)...See ()...]

 β 1074. Lacaille 20433

R.A. $10^h 28^m 40^s$
Decl. $-26^{\circ} 20' 3''$

1889.47 100.4 11.3 5.1 11.0 3^m β

1891.1 101.2 11.0 5.0 11.2 2^m A

Discovered with the 36 inch. The magnitude in D.M. is 7.2.

[β (XV)... β (2020)... β (*Pub. L. O. II*)...Aitken ()...]

 β 411. Lacaille 4360

R.A. $10^h 30^m 25^s$
Decl. $-26^{\circ} 3' 3''$

1878.28 294.6 1.33 0.7... 8.0 2^m Cin

1892.28 288.3 1.08 0.4... 8.2 3^m β

1892.30 290.0 1.20 0.8... 8.5 4^m 1.v

1893.32 287.0 1.00 7 ... 8.0 2^m Sel

1898.16 278.8 0.87 ... 1^m See

Discovered with the 6-inch. Change is uncertain. A naked-eye star according to HERS. In Cord. G. C. 6.6m *Hydra*.

[β (VII)... β (2103,3141)... β (*Pub. L. O. II*)...Cin...Cin...
Collins and Ly (*A. J.* 278) (*Proc. Harvard Coll. Obs.* 1892)...Sellers (3240)...See ()...]

 β 1075. ϕ^2 *Hydrae*

R.A. $10^h 30^m 25^s$
Decl. $-15^{\circ} 43' 3''$

1889.14 277.1 3.03 6 ... 13.0 3^m β

1898.22 283.1 2.92 ... 1^m See

1899.02 275.3 3.25 ... 13.1 2^m β

Discovered with the 36-inch. AUWERS gives the proper motion of the bright star, $0''.065$ in the direction of $287^\circ 0$. This is nearly in the line of the companion, so that it will soon be a very difficult object if the companion does not have the same movement. The measures point to common proper motion.

[β (XV)... β (2020)... β (*Pub. L. O. II*)...See ()...]

 β 913. *40 Leonis Minoris*

R.A. $10^h 30^m 26^s$
Decl. $-26^{\circ} 57' 3''$

A and B

1880.30 122.8 19.92 6.0... 13.0 4^m β

1892.14 119.9 12.27 6.0... 12.7 3^m β

1898.34 119.3 12.85 6.0... 13.9 3^m A

1899.02 118.1 13.16 ... 12.5 1^m β

A and C

1898.31 77.3 39.71 ... 11 1^m A

A and D

1899.02 275.9 55.75 ... 13.5 1ⁿ β

Discovered with the 18½-inch. The distant star, C, was added by AITKEN with the 36-inch. PORTER gives the proper motion of the principal star, $\alpha^s 131$ in the direction of 250° 7'. This seems to account for the change in the companion.

[β (XIII)... β^1 ... β (Ait. *Reg.* XVIII, 140)... β (3142)... β (Pub. L. O. II)...Aitken ()...]

 β 914. Lalande 20750

R.A. 10^h 30^m 46^s $\frac{1}{2}$
Decl. — 10° 14' $\frac{1}{2}$

1880.27 338.6 1.30 6.8...11.4 2ⁿ β
1894.24 337.8 1.46 7.7...12.0 2ⁿ W

Discovered with the 18½-inch.

[β (XIII)... β^1 ...Wilson ()...]

 β 595. Lalande 20804

R.A. 10^h 41^m 48^s $\frac{1}{2}$
Decl. — 14° 29' $\frac{1}{2}$

1878.21 14.6 2.32 9.0...11.0 1ⁿ β
1879.20 17.8 2.00 8.5...10.0 1ⁿ β
1880.26 18.1 1.95 ... 1ⁿ Pt
1884.99 13.0 1.95 8.1...10.5 3ⁿ W
1898.26 12.4 2.24 9.0...10.5 3ⁿ A

Discovered with the 18½-inch. Probably without change.

[β (XI)... β^1 ...Cin⁵...Wilson (Cin⁶)...Pritchett (Pub. *Morrison Obs.* I)...Aitken ()...]

 β 596. Leonis 222

R.A. 10^h 43^m 2^s $\frac{1}{2}$
Decl. + 17° 47' $\frac{1}{2}$

1878.26 277.3 2.38 6.5...13 2ⁿ β
1886.22 274.7 2.96 ... 2ⁿ H Σ
1891.28 278.6 2.56 6.7...11.7 3ⁿ β

Discovered with the 18½-inch. Unchanged.
Lalande 20827.

(X)... β^1 ... β (3114)... β (Pub. L. O. II)...H Σ ()...]

 β 915. D.M. (25°) 2303

R.A. 10^h 43^m 13^s $\frac{1}{2}$
Decl. + 24° 55' $\frac{1}{2}$

1880.37 232.9 1.18 9.0... 9.2 2ⁿ β
1892.30 232.5 0.7 ... 9.0 4ⁿ Lv
1895.35 226.7 1.14 ... 1ⁿ Lew
1896.52 231.2 1.26 ... 2ⁿ A
1897.30 226.2 ... 1ⁿ Bow

Discovered with the 18½-inch. Apparently without change. Near Σ 1478.

[β (XIII)... β^1 ...Lv (A. J. 278) (Proc. *Haverford Coll. Obs.* 1892)...Lewis (Mon. Not. LVI, 359) (Greenwich Obs.) 1895)...Aitken (3395)...Bowyer (Mon. Not. LIX, 400)...]

 β III. S.D. (8°) 3023

R.A. 10^h 45^m 11^s $\frac{1}{2}$
Decl. — 8° 28' $\frac{1}{2}$

1875.21 3.3 3.32 9.9...10.3 3ⁿ J
1880.66 6.3 3.59 9.0... 9.3 2ⁿ β
1881.28 6.2 3.51 ... 1ⁿ Pt
1884.57 5.0 3.65 9.0... 9.3 3ⁿ W
1886.30 3.3 3.54 9.0... 9.0 1ⁿ LM
1888.24 5.4 3.51 9.4... 9.5 5ⁿ Lv
1898.25 4.6 3.52 9.0... 9.0 3ⁿ A

Discovered with the 6-inch. Without change.

[β (III)... β (Mon. Not. XXXIV, 50)... β^1 ...J (II)...LM...Lv)...Wilson (Cin⁵)...Pritchett (Pub. *Morrison Obs.* I)...Aitken ()...]

 β 597. D.M. (21°) 2285

R.A. 10^h 48^m 20^s $\frac{1}{2}$
Decl. + 24° 21' $\frac{1}{2}$

1878.22 46.9 0.88 8.5... 11.0 2ⁿ β
1894.24 46.2 0.79 8.8... 10.7 3ⁿ W

Discovered with the 18½-inch.

[β (XI)... β^1 ...Wilson ()...]

β 1076. γ δ ϵ ζ η θ ι κ λ μ ν ξ \omicron π ρ σ τ υ ϕ χ ψ ω

R.A. 18h 59m 12.5s
Decl. $-1^{\circ} 10' 30''$

1898.22	35.0	0.88	0.0	110.7	3 μ	β
1898.22	35.0	0.82	0.0	110.5	1 μ	A

Discovered with the 36-inch. AUWERS gives the proper motion of this star $\sigma^{\circ} 86$ in the direction of 84.7 . It is obvious from the measures that, if this value is approximately correct, the movement belongs to both components, and that the companion has a retrograde motion around the primary. With this proper motion, and the relation given by the measures of 1898, the position of the companion in 1898, if fixed in space, should have been

1898.22 35.0 0.82 0.0 110.5 1 μ A

 β 508. γ δ ϵ ζ η θ ι κ λ μ ν ξ \omicron π ρ σ τ υ ϕ χ ψ ω

R.A. 18h 59m 12.5s
Decl. $-1^{\circ} 10' 30''$

1898.22	35.0	0.88	0.0	110.7	3 μ	β
1898.22	35.0	0.82	0.0	110.5	1 μ	A
1898.26	221.3	46.40	5.5	14.0	2 μ	A
1898.96	220.5	46.83	...	...	1 μ	β

Discovered with the 18 $\frac{1}{2}$ -inch. The proper motion of 59 *Leonis* from AUWERS is $\sigma^{\circ} 85$ in the position angle of 270° .

1898.22 35.0 0.88 0.0 110.7 3 μ β (31421) β (Pub. J. O. U.) Aitken ()...

 β 1077. α β γ δ ϵ ζ η θ ι κ λ μ ν ξ \omicron π ρ σ τ υ ϕ χ ψ ω

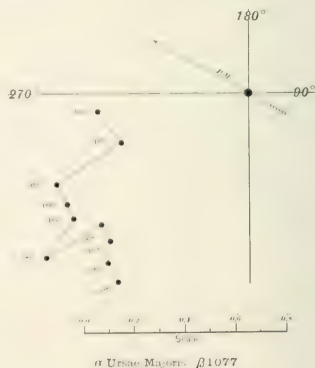
R.A. 18h 59m 12.5s
Decl. $-1^{\circ} 10' 30''$

1898.22	35.0	0.91	2.0	110.7	1 μ	β
1898.22	35.0	0.87	...	...	2 μ	β
1898.22	316.7	0.0	...	...	3 μ	H Σ
1898.22	316.0	0.00	110.0	...	4 μ	β
1898.22	316.0	0.78	110.0	...	5 μ	β
1898.22	316.0	0.00	...	...	6 μ	Bar
1898.22	316.0	0.00	...	...	7 μ	Com
1898.22	316.0	0.00	...	...	8 μ	Com
1898.22	316.0	0.00	...	...	9 μ	β

1898.22	316.0	0.51	...	...	1 μ	β
1898.22	316.0	0.0	...	...	1 μ	A

This interesting system was discovered with the 36-inch. The measures at Mt. Hamilton were sufficient to show that it was a binary, since the proper motion of the principal star would have been apparent after a short interval in the changed position of the companion. AUWERS (*Fundamental Catalogue*) gives the proper motion of α *Ursae* as $\sigma^{\circ} 149$ in the direction of $240^{\circ} 2$, and it was evident at the time it was first seen double that the companion had the same movement in space, as other wise it would have been recorded as a double star long before. The orbital motion is retrograde, and thus far about 3.5 per year. There seems to have been no great change in the distance. It is not improbable that this is about the maximum distance, and that it may prove to have a short period. With a much nearer approach it will be difficult, if not impossible, to measure with the largest instruments now in use.

The principal positions are shown on the accompanying diagram:



There is a small star $384''.95$ distant from α in the direction of 270° 5 $115^{\circ} 1.12$ which has nearly the same proper motion, $\sigma^{\circ} 222$ in $232^{\circ} 5$.

1898.22 35.0 0.88 0.0 110.7 3 μ β (31421) β (Pub. J. O. U.) Aitken ()...
1898.22 35.0 0.82 0.0 110.5 1 μ A
1898.26 221.3 46.40 5.5 14.0 2 μ A
1898.96 220.5 46.83 ... 1 μ β

β 599. 65 LeonisR.A. 11^h 0^m 47^s $\frac{1}{2}$
Decl. + 2 36 $\frac{1}{2}$

1878.20	82.4	1.78	5.5...11.5	4 ⁿ	β
1879.27	84.3	1.47	6.0... 9.5	1 ⁿ	Cin
1886.28	88.7	2.23	...	2 ⁿ	HΣ
1887.32	87.0	1.66	5.5...11.0	3 ⁿ	T
1889.27	88.5	1.78	5.6...10.5	3 ⁿ	β
1893.34	86.7	1.87	...	2 ⁿ	Sp
1894.24	85.3	1.94	6.0...10.8	3 ⁿ	W
1899.13	93.2	1.95	...	1 ⁿ	β

Discovered with the 18½-inch. AUWERS gives the proper motion of this star $\alpha^s 434$ in the direction of 262°. It is obvious from the measures that this belongs also to the small star, and they must form a physical system. The relative motion appears to be direct.

[β (X)...β²...β (2930)...β (Pub. L. O. II)...Cin⁵...Tarrant (2899)...Sp (III)...Wilson ()...HΣ ()...]

β 220. Crateris 22R.A. 11^h 0^m 33^s $\frac{1}{2}$
Decl. 17 51 $\frac{1}{2}$

1875.27	143.6	0.58	6.4... 7.0	2 ⁿ	J
1877.29	150.1	0.65	5.8... 6.2	1 ⁿ	Cin
1877.93	143.5	0.55	6.4... 7.0	10 ⁿ	Sp
1878.22	140.0	...	6.0... 6.8	2 ⁿ	Cin
1880.21	323.8	0.87	6.0... 7.0	1 ⁿ	Cin
1880.33	151.1	0.68	...	1 ⁿ	Pt
1884.10	149.1	0.45	5.0... 6.4	5 ⁿ	En
1887.27	140.3	0.58	...	3 ⁿ	Sp
1889.10	136.1	0.71	6.1... 6.8	4 ⁿ	Lv
1890.24	137.0	0.65	6.5... 7.0	3 ⁿ	T
1893.38	140.3	0.66	6.2... 6.6	2 ⁿ	J
1898.16	138.8	0.44	...	1 ⁿ	See

Discovered with the 6-inch. This is ψ *Crateris* of BODE. In ARGELANDER and HEIS 6 m. Lalande 21445. Very little, if any, change.

[β (iv)...β (Mon. Not. XXXIV, 382)...J (i)...J (2086)...Cin⁴...Cin⁵...Cin⁶...Sp (2133)...Sp (II app.)...Pritchett (Pub. Morrison Obsv. I)...Engelmann (2678)...Lv...Tarrant (3186)...Jones (A. J. 312)...See ()...]

β 1282. δ LeonisR.A. 11^h 7^m 43^s $\frac{1}{2}$
Decl. + 21 11 $\frac{1}{2}$

B and C

1889.09 190± 1± 9.5...12 β

A and BC

1899.13 344.5 187.32 3 1ⁿ β

I find in my L. O. Observing book, under date of February 4, 1889, with the 36-inch, noted, "The distant companion to δ *Leonis* is a very difficult double," with angle and distance estimated as given above. I have examined this several times with the 40-inch, but have not been able to see the close pair. As there was no doubt expressed of the duplicity of the small star, it is inserted here.

[Since the foregoing was written I have received from AITKEN a set of measures with the 36-inch, giving:

1899.44 204.3 0.36 9.0... 9.3 3ⁿ A

There is, therefore, no doubt of the duplicity of this star.]

β 916. Crateris 31R.A. 11^h 8^m 4^s $\frac{1}{2}$
Decl. 14 17 $\frac{1}{2}$

1879.13	360	0.75	7.5	3	
1879.27	354.4	...	8.5...	1 ⁿ	Cin
1880.33	368.0	...	...	1 ⁿ	Pt
1884.77	362.2	...	8.0... 9.5	2 ⁿ	W
1888.45	357.7	0.64	7.0... 8.2	3 ⁿ	Lv
1889.25	360.2	0.88	7.5... 8.3	3 ⁿ	β
1897.23	354.5	0.72	7+... 8+	1 ⁿ	Lv
1898.27	360.6	0.66	7.4... 7.6	4 ⁿ	V

Discovered with the 18½-inch. Early measures are wanting, but the change, if any, is slow. The magnitude in S.D. is 8.0. Lalande 21488.

[β (xiii)...β²...β (2930)...β (Pub. L. O. II)...Cin⁵...Pritchett (Pub. Morrison Obsv. I)...Wilson (Cin²)...Lv...Doolittle (Pub. Flower Obsv. I)...Aitken ()...]

β 1283. *U. M. (16) 1283.*

R.A. $11^{\text{h}} 37^{\text{m}} 27^{\text{s}}$
Decl. $-16^{\circ} 11' 3''$

Henry (18) observing with a 4-inch telescope on February 4, 1889, found this star was under observation with the 36-inch, and it was noted: "The distance of β from α is 0.5 double." I have examined this several times with the 40-inch, and on one occasion it appeared elongated, but nothing further could be done with it. The D.M. magnitude is 9.0. It is 10.0 f , and 4.58" n of θ Leonis. I am certain this star will prove to be a close pair, and therefore give it a place in this catalogue.

 β 600. *Crateris 36*

R.A. $11^{\text{h}} 37^{\text{m}} 27^{\text{s}}$
Decl. $-16^{\circ} 11' 3''$

A and B

1875.15	226.4	6.25	6.5...12.0	1 n	β
1892.17	216.0	1.23	6.5...13.0	2 n	β
1898.23	206.0	1.00	6.0...12.0	3 n	β

A and C (H. N. 26)

1875.15	97.6	67.06	...	1 n	Sh
1878.89	97.3	61.25	6.0...8.5	3 n	β
1892.16	97.6	60.46	6.7...8.5	3 n	β
1898.27	97.7	60.59	6.0...8.5	3 n	β
1898.29	97.4	60.40	7.0...8.7	1 n	β

The minute attendant to this wide pair of HERSHEL (Sh 120) was discovered with the 18½-inch. There appears to be a decided change in the close pair. All the measures of A and C are given above. The distance in Sh is probably too large. These stars are respectively W' XL 148 and 152. HEIS gives this as a naked-eye star, 6-7 m; Cord. G.C. 6.0. Lalande 21540.

(H. N. 26) β 600 = β 1283 (H. N. 26) = β 1283 (H. N. 26) = β 1283 (H. N. 26)

 β 791. *W' S. C. 107*

R.A. $11^{\text{h}} 37^{\text{m}} 27^{\text{s}}$
Decl. $-16^{\circ} 11' 3''$

1875.15	106.5	2.05	8.5...10.0	1 n	β
1878.38	106.5	2.21	8.5...10.0	3 n	Com
1898.27	107.3	2.15	8.7...10.8	3 n	A

Discovered with the 15½-inch at the Washburn Observatory. In D.M. 9.0 m.

[β 1283] β Comstock (H. N. 26) = β 1283 (H. N. 26) = β 1283 (H. N. 26)

 β 26. *Lalande 21607*

R.A. $11^{\text{h}} 17^{\text{m}} 45^{\text{s}}$
Decl. $-9^{\circ} 40' 3''$

1875.50	70.3	2.80	7.2...10.2	4 n	J
1879.31	66.4	2.66	7.5...10.0	2 n	Cin
1888.67	68.7	2.86	7.9...10.4	2 n	Lv
1890.23	71.0	2.92	7.0...10.5	2 n	T
1899.11	70.8	2.60	7.7...10.0	2 n	β

Discovered with the 6-inch. Probably without change.

[β 26] β (H. N. 26) = β 26 (H. N. 26) = β 26 (H. N. 26)

 β 601. *S.D. (16) 3259*

R.A. $11^{\text{h}} 23^{\text{m}} 18^{\text{s}}$
Decl. $-16^{\circ} 41' 3''$

B and C

1878.32	226.9	6.81	8.0...9.0	1 n	β
1879.34	232.3	6.73	8.0...9.0	1 n	β
1879.18	224.6	6.87	7.2...8.7	2 n	Cin
1880.29	224.9	...	8.0...9.0	1 n	Cin
1886.29	217.9	...	7.5...9.0	1 n	L.M
1886.31	219.9	1.64	8.5...9.0	1 n	W
1888.65	223.2	6.78	7.7...8.7	2 n	Lv
1898.26	220.0	1.64	8.5...9.3	3 n	A
1898.38	220.9	6.95	...	1 n	See

A and BC (S 627)

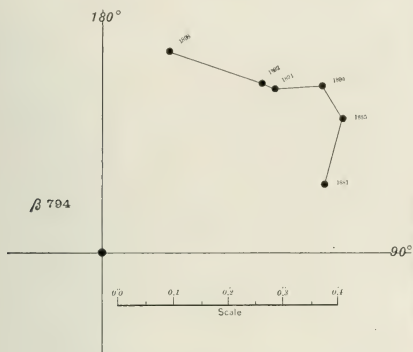
1878.34	148.7	26.25	...	1 n	H'
1825.25	336.7	29.06	8.5...9.0	3 n	S
1878.34	331.6	28.16	7.5...8.0	2 n	β
1879.30	336.9	28.21	8.0...8.5	2 n	Cin
1880.29	331.6	28.30	6.0...6.5	2 n	Cin
1886.31	336.8	27.69	8.0...8.5	1 n	W
1898.26	336.4	28.31	7.5...8.5	3 n	A
1898.38	331.1	28.36	...	1 n	See

The close pair was discovered with the 18½-inch. There is no material change, and the wide pair is

[β (XII)... β^2 ...Comstock (*Pub. Flower Obs.*, 1904, VI)...Dennis
little (*Pub. Flower Obs.*, I)...Aitken (...)]

orbital motion, and will probably have a short period.

The arc so far described will be seen from the accompanying diagram.



The distant companions, C and D, were added with the 36-inch, but C had been seen by HΣ in measuring AB. Thus far the positions are unchanged.

[β (XII)...β¹...β (3048,3114,3142)...β (Std. Meas. IX, 299)
...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy.
VI, X)...Sp (III)...Aitken ()...HΣ ()...]

β 918. Lalande 22496

R.A. 11^h 50^m 36^s }
Decl. + 32° 52' }

1880.37	231.3	7.45	6.8...	13.0	2 ⁿ	β
1891.22	234.3	7.33	6.4...	12.7	3 ⁿ	β
1899.13	230.8	7.21	6.6...	13.0	2 ⁿ	β

Discovered with the 18½-inch. In HEIS and ARGELANDER, as a naked-eye star, 6.7 m (*Ursa Major*). Three faint nebulae in a low field-power β.

[β (XII)...β¹...β (3114)...β (Pub. L. O. II)...]

β 919. W² XI. 1013

R.A. 11^h 53^m 7^s }
Decl. + 33° 50' }

1880.37	16.2	4.22	6.3...	12.3	3 ⁿ	β
1891.22	14.3	4.60	6.2...	11.7	3 ⁿ	β
1899.11	15.7	4.30	6.7...	12.5	2 ⁿ	β

Discovered with the 18½-inch. A naked-eye star in *Ursa Major* (HEIS). Magnitude in D.M. 6.0.

[β (XII)...β¹...β (3114)...β (Pub. L. O. II)...]

β 795. Radcliffe 2778

R.A. 11^h 53^m 51^s }
Decl. + 71° 20' }

A and B

1881.30	327.0	13.82	7.7...	13	3 ⁿ	β
1885.61	329.3	14.44	...	...	2 ⁿ	HΣ
1888.40	327.2	14.44	8	12.8	2 ⁿ	Com
1896.43	328.0	14.39	...	...	3 ⁿ	A

C and D

1881.30	116.2	5.78	7.7...	12.5	3 ⁿ	β
1885.61	116.3	6.06	...	...	1 ⁿ	HΣ
1888.32	116.0	5.58	8	12.3	2 ⁿ	Com
1896.43	114.0	6.25	...	...	3 ⁿ	A

A and C (OS 242 *rej.*)

1868.11	149.6	33.72	7.1...	7.3	3 ⁿ	J
1881.30	150.9	33.59	7.7...	7.7	3 ⁿ	β
1885.61	150.7	33.52	...	...	1 ⁿ	HΣ
1888.28	151.4	33.91	8	8	1 ⁿ	Com
1896.58	150.9	33.49	...	...	3 ⁿ	Eich

The faint companions to the wide pair of OS were noted with the 15½-inch at the Washburn Observatory. All the measures of A and C are given. These stars are fixed.

[β (XII)...β¹...Comstock (Pub. Washburn Obsy. VI)...Aitken (3395)...A (I)...Eichelberger (A.J. 397)...HΣ ()...]

β 1079. Lalande 22586

R.A. 11^h 54^m 34^s }
Decl. 21° 7' }

1880.30	147.9	11.00	6.2...	13.3	3 ⁿ	β
1898.20	148.3	11.55	...	...	1 ⁿ	See

Discovered with the 36-inch. In GOULD 6.5 m (*Corvus*).

[β (XV)...β (2020)...β (Pub. L. O. II)...See ()...]

β 921. Corvi 22R.A. $12^h 11^m 42^s$ ℓ
Decl. $-23^\circ 21' \lambda$

1880.55	218.5	3.10	7.5...11.6	5 ⁿ	β
1892.25	217.3	3.20	7.6...10.3	3 ⁿ	β
1892.31	218.5	2.95	7.0...12.0	4 ⁿ	Lv
1899.16	215.7	3.39	7.2... 9.7	3 ⁿ	β

Discovered with the $18\frac{1}{2}$ -inch. Lalande 23027. $[\beta$ (XIII)... β^1 ... β^2 ... β (3142)... β (Pub. L. O. II)...Lv (A.J. 278) (Proc. Haverford Coll. Obs., 1892)...] **β 27. Lalande 23106**R.A. $12^h 13^m 59^s$ ℓ
Decl. $+14^\circ 31' \lambda$

1874.30	105.0	...	7...12	1 ⁿ	WS
1875.32	113.1	3.43	7.0...11.0	2 ⁿ	O Σ
1875.53	106.5	3.39	7.1...11.0	4 ⁿ	J
1881.37	102.6	3.09	...	1 ⁿ	Pt
1882.45	109.3	3.27	7.0...11.0	3 ⁿ	Ho
1886.30	106.8	3.58	...	3 ⁿ	H Σ
1898.22	104.1	3.54	7.0...11.0	3 ⁿ	D
1898.32	105.0	3.41	7.2...11.5	3 ⁿ	A

Discovered with the 6-inch. Evidently without change.

 $[\beta$ (I)... β (Mem. Not. XXXIII, 351)...Wilson and Seabroke (Mem. R. A. S. XLII)...Pritchett (Pub. Morrison Obs., 1)... d (I)...O Σ (Poulkova Obs., X)...Hough (2978)...Doolittle (Pub. Flower Obs., 1)...Aitken ()...H Σ ()...] **β 605. Corvi 26. B.A.C. 4149**R.A. $12^h 13^m 58^s$ ℓ
Decl. $-21^\circ 30' \lambda$

1878.22	144.2	1.25	6.0... 8.0	2 ⁿ	β
1878.43	136.3	1.01	6.2... 8.3	2 ⁿ	Cin
1882.40	141.7	0.53	6... 8	2 ⁿ	Sp
1884.32	133.0	...	8.0... 9.0	1 ⁿ	W
1888.25	157.1	0.8 \pm	...	1 ⁿ	Sp
1899.04	137.0	0.8 \pm	6.0... 8.5	1 ⁿ	Lv
1891.32	143.8	1.03	6.2... 8.4	3 ⁿ	β

Discovered with the $18\frac{1}{2}$ -inch. The measures are not accordant, but there is probably no sensible change. The magnitude in GOULD is 6.4, and $6\frac{1}{2}$ in B.A.C. It is near ζ Corvi. Lalande 23119. $[\beta$ (X)... β^1 ... β (3114)... β (Pub. L. O. II)...Cin Σ ...Sp (II, III)...Wilson (Cin Σ)...Lv...] **β 1245. ζ Corvi**R.A. $12^h 14^m 21^s$ ℓ
Decl. $-21^\circ 33' \lambda$

1891.31	42.3	4.81	5.5...13.8	3 ⁿ	β
1899.16	48.7	5.76	5.0...14.0	2 ⁿ	A

The very minute companion was discovered with the 36-inch. The proper motion of the bright star is given by AUWERS as $0''.130$ in the direction of 254° . It is probably only an optical pair as the change in the position of the companion shown by the two sets of measures given above agrees very closely with the proper motion of A. The minimum distance of the companion was $2''.6$ about 1860.

 $[\beta$ (XVIII)... β (3113)... β (Pub. L. O. II)...Aitken ()...] **β 606. Corvi 35**R.A. $12^h 19^m 48^s$ ℓ
Decl. $-14^\circ 17' \lambda$

1878.30	97.9	1.38	7.0... 9.0	2 ⁿ	β
1882.41	134.5	0.40	7... 9	2 ⁿ	Sp
1889.04	93.5	1.20	...	3 ⁿ	Sp
1891.26	99.1	1.25	7.2... 8.2	3 ⁿ	β
1892.40	99.8	1.21	...	1 ⁿ	Sp
1898.24	95.3	1.43	7.0... 9.0	2 ⁿ	D

Discovered with the $18\frac{1}{2}$ -inch. The first measures of Sp appear to belong to some other pair. I could not find any other pair in the vicinity with the 36-inch. Lalande 23250.

 $[\beta$ (X)... β^1 ... β (3114)... β (Pub. L. O. II)...Sp (III)...Doolittle (Pub. Flower Obs., 1)...] **β 922. Lalande 23254**R.A. $12^h 19^m 48^s$ ℓ
Decl. $-14^\circ 17' \lambda$

1880.22	100.	0.5	8.0... 8.5		β
1889.99	167.4	0.6	...	3 ⁿ	Sp
1891.27	105.3	0.74	8.1... 8.9	3 ⁿ	β
1892.39	103.3	0.55	...	1 ⁿ	Sp
1898.24	157.8	0.77	8... 9	2 ⁿ	D

Discovered with the $18\frac{1}{2}$ -inch. The change, if any, is small. $[\beta$ (XIII)... β^1 ... β (3114)... β (Pub. L. O. II)...Sp (III)...Doolittle (Pub. Flower Obs., 1)...]

there has been no change. Previously seen at Harvard, but not printed until after β (x). O Σ measures this star from γ *Virginis* for proper motion of the latter.

[β (x)... β^1 ... β^2 ... β (2930)... β (*Pub. L. O. II*)...Cin⁵...
Cin⁶...*Annals Harvard Obs.*, XIII... O Σ (*Poulkova Obs.*)...
x, p. 89)...]

 β 924. 31 *Virginis*

R.A. 12^h 35^m 52^s $\frac{1}{2}$
Decl. + 7 28' $\frac{1}{2}$

1880.14	29.0	3.66	5.8...	11.6	5 ⁿ	β
1883.26	36.0	3.9	...	...	1 ⁿ	Perry
1891.24	29.0	3.94	5	...	11.5	3 ⁿ β
1899.06	31.8	3.79	...	11.4	2 ⁿ	β

Discovered with the 18 $\frac{1}{2}$ -inch. The proper motion of this star is 0".106 in the direction of 273°2 (AUWERS). With this movement and the measures of 1880, the small star, if fixed in space, should be at the date of the last measures, 50°7 : 4'88.

[β (XIII)... β^1 ... β^2 ... β (3114)... β (*Pub. L. O. II*)...Perry
(*Eng. Mech.*, XXXVIII, 192)...]

 β 459. W¹ XII. 699

R.A. 12^h 41^m 58^s $\frac{1}{2}$
Decl. + 4 7' $\frac{1}{2}$

1877.93	289.5	3.80	8.2...	11.5	2 ⁿ	Δ
1880.61	292.6	3.50	...	...	2 ⁿ	Pt
1893.30	295.0	3.91	8.0...	11.0	3 ⁿ	W
1898.28	292.9	3.76	8.0...	11.7	3 ⁿ	A

Discovered with the 6-inch. Without change.

[β (IX)... β (*Mon. Not. XXXVIII*, 78)...J (1)...Pritchett (*Pub. Morrison Obs.*, 1)...Wilson ()...Aitken ()...]

 β 925. Groombridge 1938

R.A. 12^h 51^m 0^s $\frac{1}{2}$
Decl. + 44 12' $\frac{1}{2}$

1879.82	211.3	7.11	6.5...	12.0	2 ⁿ	β
1882.41	209.5	6.48	6.5...	13.0	2 ⁿ	Ho
1892.13	211.9	6.90	6.3...	11.4	3 ⁿ	β
1899.08	211.6	6.77	6.8...	12.5	1 ⁿ	β

Discovered with the 18 $\frac{1}{2}$ -inch. KUSTNER gives the proper motion of this star 0".019 in the direction of 294°9. The measures do not cover a sufficient time to show whether or not the motion belongs to both stars. This is a naked-eye star in *Canes Venatici*.

[β (XIII)... β^1 ... β^2 ... β (3142)... β (*Pub. L. O. II*)...Hough
(2978)...]

 β 926. Lalande 24147

R.A. 12^h 52^m 14' $\frac{1}{2}$
Decl. — 5 24' $\frac{1}{2}$

1880.33	270.4	2.06	8.1...	11.3	3 ⁿ	β
1892.24	274.8	2.24	8.3...	11.0	3 ⁿ	β
1892.33	269.9	2.23	8.2...	11.7	3 ⁿ	Lv

Discovered with the 18 $\frac{1}{2}$ -inch. There is no indication of motion.

[β (XIII)... β^1 ... β^2 ... β (3142)... β (*Pub. L. O. II*)...A. J. 278)
(*Proc. Haverford Coll. Obs.*, 1892)...]

 β 1081. 37 *Comae*

R.A. 12^h 54^m 32^s $\frac{1}{2}$
Decl. + 31 26' $\frac{1}{2}$

1880.13	351.3	5.15	4.5...	13.8	3 ⁿ	β
1898.52	348.7	5.24	...	14.0	2 ⁿ	A

Discovered with the 36-inch. AUWERS gives the proper motion of this star, 0".034 in the direction of 268°3. It is impossible to say with certainty from the two sets of measures whether the small star shares in this movement. If it does not, the angle should have increased 3°5 at the last date, the distance remaining substantially the same.

[β (xv)... β (2929)... β (*Pub. L. O. II*)...Aitken ()...]

 β 112. Piazzi XII. 243

R.A. 12^h 54^m 46' $\frac{1}{2}$
Decl. + 10' 1' $\frac{1}{2}$

B and C

1874.30	293.4	...	9	...	10	2 ⁿ	WS
1875.08	292.4	1.75	9.6	...	10.0	3 ⁿ	Δ
1892.14	293.7	1.80	9.3	...	9.8	3 ⁿ	β
1892.32	291.1	1.98	9.1	...	9.8	3 ⁿ	Lv

β 929. 48 *Urginis*R.A. 12^h 57^m 43^s $\frac{1}{2}$
Decl. $-3^{\circ} 1'$

1879.40	229.4	0.48	6.2...	6.2	3 ^m	β
1879.40	233.2	...	7.0...	8.0	1 ^m	Cin
1880.35	227.3	...	...	...	1 ^m	Cin
1881.42	222.1	0.33	...	...	1 ^m	Big
1881.46	223.6	0.48	6.0...	6.0	3 ^m	β
1885.86	42.2	0.38	...	...	6 ^m	En
1887.54	222.7	0.36	...	...	2 ^m	Sp
1888.25	219.1	0.54	6.3...	6.3	5 ^m	T
1888.32	220.1	0.64	6.0...	6.5	2 ^m	Lv
1889.33	217.1	0.66	6.2...	6.2	5 ^m	T
1891.26	221.2	0.50	6.0...	6.3	3 ^m	β
1892.40	223.7	0.5...	...	...	1 ^m	Sp
1897.32	220.8	0.67	6...	6+	3 ^m	A
1898.32	212.3	0.60	...	...	1 ^m	Bow
1899.35	219.2	0.58	6.2...	6.6	2 ^m	A

Discovered with the 18½-inch. There may be some retrograde motion, but it is very slow. The components have a common proper motion, and it is therefore a physical system. The proper motion from AUWERS is 0.091 in the direction of 258°.7.

[β (XII)...β¹...β (3114)...β (*Pub. L. O. II*)...Cin⁵...Cin⁶...Engelmann (2786)...Lv¹...Lv (*Sid. Mess.* VIII, 77)...Tarrant (2091, 3186)...Sp (III)...Bigeordan (*Annals Paris Obs.* 1883)...Aitken (3465)...Bowyer (*Mon. Not. LIX*, 400)...Aitken ()...]

β 798. Lalande 24307R.A. 12^h 58^m 40^s $\frac{1}{2}$
Decl. $-17^{\circ} 2'$

1881.38	174.3	0.54	8.1...	8.5	5 ^m	β
1892.40	172.6	0.44	8.1...	8.5	2 ^m	β

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β¹...β (31142)...β (*Pub. L. O. II*)...]

β 1083. Piazzini XII. 268R.A. 13^h 0^m 27^s $\frac{1}{2}$
Decl. $+20^{\circ} 40'$

B and C

1889.11	237.3	0.49	11.5...	11.7	3 ^m	β
1897.38	243.6	0.42	...	...	1 ^m	Lew
1898.30	234.7	0.40	...	...	1 ^m	Lew
1898.31	226.6	0.38	11.2...	11.7	2 ^m	β
1898.52	238.2	0.47	12.5...	12.5	2 ^m	A

A and BC ($\frac{1}{2}$) H 26381

1831	209.6	6...	6...	1 ^m	H
1878.42	218.9	6.54	6...	1 ^m	β
1889.11	219.9	6.23	6.5...	3 ^m	β
1898.03	219.1	6.35	...	3 ^m	Lew
1898.31	218.4	6.25	6.2	2 ^m	β
1898.52	219.1	6.40	...	2 ^m	A
1898.94	217.8	6.16	...	1 ^m	Bar

A and D

1831	6.0	20±	...	1 ^m	H
1878.42	7.2	40.28	...	1 ^m	β
1898.31	9.5	39.24	...	2 ^m	β
1898.52	8.8	39.34	...	2 ^m	A

The duplicity of Herschel's nearest companion was discovered with the 36-inch. This is a naked-eye star in *Coma Berenices*. It is probable that B and D are only optical companions. There is a faint nebula in the field (Dreyer 4966), 149.1 distant, in the direction of 36°.

On the occasion of my second measure of these stars with the 40-inch in 1898, I saw as I supposed a very minute star near A, at a distance of perhaps 2" in the second quadrant. When the measure then being made was finished, the conditions had changed, and the new star could not be seen. It was looked for several times subsequently with the 40-inch without success. I think it is a real star.

[β (XV)...β (2929)...β¹...β (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX*, 400)...Aitken ()...Barnard ()...]

β 930. B.A.C. 4384R.A. 13^h 0^m 28^s $\frac{1}{2}$
Decl. $+45^{\circ} 33'$

1879.28	109.2	2.68	6.0...	12.3	3 ^m	β
1891.24	113.3	2.67	6.2...	11.3	3 ^m	β
1898.43	116.7	2.75	...	...	1 ^m	Lew
1898.63	116.02	3.07	...	...	1 ^m	Bry
1899.29	116.02	2.70	...	...	1 ^m	β

Discovered with the 6-inch. A naked-eye star in *Coma Venatici*.

[β (XIII)...β¹...β (3114)...β (*Pub. L. O. II*)...Lewis and Bryant (*Mon. Not. LXX*, 400)...]

1892.40	35.5	3.96	...	1 ⁿ	Sp
1893.37	33.0	4.84	8.1...	8.4	2 ⁿ J
1896.40	34.4	5.20	8 ... 8.1	3 ⁿ	Scott
1898.37	34.8	3.95	8.0...	8.6	3 ⁿ A
1899.09	37.2	4.00	9.0...	9.1	1 ⁿ β

Discovered with the 6-inch. In S.D. 8.2 m. Probably unchanged. 54 *Virginis* (=Sh 151) is 1^m 46^s p and 6' n. These two pairs are curiously similar in all respects except brightness. They have practically the same position angle, the same relative magnitudes, and differ in distance only a little more than 1'. The measure given above of 1896.40 certainly belongs to 54 *Virginis*, and this may be true of some of the others.

[β (vi)... β (2062)... δ (i)...Cin⁴...Cin⁵...Sp (ii, iii)...Wilson (Cin⁶)...Lv¹...Jones (*A. J.* 312)...Scott (*Brit. Ast. Assn.* VIII, 66)...Aitken ()...]

 β 800. Comae 201

R.A. 13^h 10^m 52^s ϵ
Decl. + 17° 40' γ

1881.36	121.5	1.27	7.1...	10.2	4 ⁿ β
1886.34	118.9	1.94	...	...	2 ⁿ H Σ
1889.12	117.1	2.17	6.9...	9.7	4 ⁿ Com
1890.33	115.5	2.02	7.5...	10.2	3 ⁿ β
1891.25	115.0	2.23	7.2...	10.7	3 ⁿ β
1892.60	117.8	2.12	...	...	5 ⁿ Sp
1894.39	114.7	2.29	...	...	1 ⁿ Com
1895.30	115.6	2.50	...	...	2 ⁿ Com
1896.39	113.1	2.50	...	...	3 ⁿ Com
1896.40	115.0	2.60	...	...	2 ⁿ Lew
1897.39	112.1	2.44	...	...	1 ⁿ Lew
1898.14	110.1	2.88	...	...	3 ⁿ D
1898.32	111.9	2.57	6.8...	10.3	3 ⁿ A
1898.37	113.5	2.33	...	...	1 ⁿ Bow
1898.39	117.0	2.53	...	...	3 ⁿ Lew
1898.54	116.4	2.54	...	...	1 ⁿ β

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. This is a very interesting physical system. The change so far has been principally in distance, indicating that the plane of the orbit is nearly in the line of sight. The system has a large proper motion, according to KRUEGER, of 0".697 in the direction of 113°6. Lalande 24652.

[β (XII)... β ... β (*Std. Mess.* IX, 299)... β (3048, 3114)... β (*Pub. L. O.* II)...Comstock (*Proc. Washburn Obs.* V, 1, xi) (*Std. Mess.* IX, 78)...Sp (iii)...Doolittle (*Pub. Flower Obs.* I)...Lewis and Bower (*Mem. Not.* LIX, 400)...Aitken ()...H Σ ()...]

 β 222. Lalande 24656

R.A. 13^h 10^m 55^s ϵ
Decl. — 20° 54' γ

1867.38	12.1	1.46	8 ... 9	1 ⁿ	Hd
1877.11	7.7	1.89	8.0...	9.0	1 ⁿ Cin
1894.44	14.7	1.50	8 ... 10	2 ⁿ	Sci
1896.48	14.5	1.51	...	3 ⁿ	A

Discovered with the 6-inch, but it had been previously seen by the Harvard observers, and is included in a list of new stars first published in 1882. The components seem to be fixed.

[β (IV)... β (*Mon. Not. Astr. Soc.* 82, 1). Cin⁵...1602. *Harvard Obs.* XIII...Sellers (3303)...Aitken (3395)...]

 β 1084. W¹ XIII. 235

R.A. 13^h 15^m 50^s ϵ
Decl. — 4° 2' γ

1889.31	89.8	2.69	7.1...	12.7	3 ⁿ β
1898.26	88.7	2.78	7.2...	13.5	3 ⁿ A

Discovered with the 36-inch. The two sets of measures show no change.

[β (xv)... β (2029)... β (*Pub. L. O.* II)...Aitken ()...]

 β 610. *Virginis* 504

R.A. 13^h 17^m 28^s ϵ
Decl. — 20° 18' γ

1878.24	18.3	4.02	6.8...	10.5	1 ⁿ β
1878.41	17.4	3.77	7.0...	10.5	1 ⁿ β
1892.25	20.3	3.69	7.8...	10.5	3 ⁿ β
1892.38	18.5	3.82	7.1...	11.8	3 ⁿ β

Discovered with the 18 $\frac{1}{2}$ -inch. Apparently without change. In GOULD 6.9 m. Lalande 24812.

[β (x)... β ... β (3142)... β (*Pub. L. O.* II)...Glasenapp (i) ...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obs.* 1892)...]

 β 460. W¹ XIII. 273

R.A. 13^h 18^m 40^s ϵ
Decl. — 15° 0' γ

1877.06	39.4	2.19	8.2...	10.5	2 ⁿ β
1878.28	33.6	1.99	8.0...	10.5	1 ⁿ β
1892.38	31.8	2.20	8.0...	10.4	3 ⁿ L.v
1892.39	33.0	2.13	8.1...	10.0	3 ⁿ β

1866. It seems to have been neglected since that time by variable star observers. It would be specially interesting to know in which, if only one, of the close stars the variability occurs. This is *Z Virginis* of some of the variable star catalogues.

[β (XIII)... β^1 ... β (Observatory III, 92)...Hall (II)...
Tarrant (2991)...*Nature*, XXVII, 617; XXX, 325...
Aitken ()...]

β 933. W² XIII, 555

R.A. 13^h 20^m 7^s $\frac{1}{2}$
Decl. + 33° 45' $\frac{1}{2}$

A and B

1879.80	30.7	1.88	8.4...	8.8	4 ^m	β
1881.41	32.8	2.46	...	...	1 ^m	Big
1888.68	29.0	2.09	8.2...	9.2	2 ^m	Lv
1891.11	31.6	2.20	...	...	3 ^m	Sp
1892.40	29.7	2.23	...	...	1 ^m	Sp
1895.41	31.0	2.20	...	...	2 ^m	Sp
1897.47	31.1	2.52	8+	9.0	1 ^m	D
1898.27	29.0	2.44	...	...	3 ^m	D
1898.37	29.5	2.32	8.3...	8.7	3 ^m	A

A and C (= H 2661)

1830.	28.0	30.2	8.0...	12-13	1 ^m	H
1879.68	21.8	34.48	...	12.5	3 ^m	β
1898.27	17.6	34.46	...	12.0	3 ^m	D
1898.37	16.5	34.71	...	12.5	3 ^m	A

The close companion to the principal star of H 2661 was discovered with the 18½-inch. The foregoing are all the measures of AC. There seems to be some change in the angle, probably from proper motion.

[β (XIII)... β^1 ...Bigourdan (*Paris Obs.*, 1883)...Lv⁴...Sp (III)...Aitken ()...Doolittle (*Pub. Flower Obs.*, 1)...]

β 611. Lalande 25159

R.A. 13^h 31^m 13^s $\frac{1}{2}$
Decl. - 14° 7' $\frac{1}{2}$

1878.35	259.4	4.63	8.5...	12.0	2 ^m	β
1882.31	260.1	...	8.7...	10.0	1 ^m	W
1886.35	266.0	...	8.5...	11.5	1 ^m	W
1893.37	263.2	4.68	9.0...	12.0	2 ^m	W
1898.44	258.8	4.86	8.8...	12.2	2 ^m	A

Discovered with the 18½-inch. Unchanged.

[β (X)... β^1 ...Wilson (Cin⁹)...Wilson ()...Aitken ()...]

β 934. D.M. (51) 1855

R.A. 13^h 32^m 56^s $\frac{1}{2}$
Decl. + 51° 4' $\frac{1}{2}$

1879.28	264.1	1.04	9.0...	9.2	3 ^m	β
1891.31	266.5	1.26	9.1...	9.1	3 ^m	β

Discovered with the 18½-inch. In D.M. 9.4 III.
It is 2^m 39^s $\frac{1}{2}$ 1774 *Vol.*

β (XIII)... β^1 ... β (3114)... β (*Pub. L. O. II*)...]

β 612. B.A.C. 4559

R.A. 13^h 33^m 40^s $\frac{1}{2}$
Decl. - 11° 21' $\frac{1}{2}$

1878.33	56.1	0.23	6.0...	6.0	3 ^m	β
1878.96	60.5	0.24	6...	6	4 ^m	III
1884.02	52.4	0.28	...	...	5 ^m	En
1886.44	106.6	...	...	...	1 ^m	H Σ
1889.46	166.8	0.37	...	...	3 ^m	Sp
1890.39	179.7	0.3	...	...	2 ^m	Sp
1891.28	191.1	0.28	6.4...	6.5	3 ^m	β
1891.44	191.1	0.32	6...	6	3 ^m	III
1891.49	186.1	0.27	...	...	1 ^m	Sp
1892.14	108.7	0.31	6.3...	6.5	3 ^m	β
1892.37	106.9	0.35	...	...	2 ^m	H Σ
1892.40	104.6	0.25	...	...	3 ^m	Sp
1893.42	207.4	0.36	6.1...	6.2	5-1 ^m	W
1893.45	199.9	0.28	...	...	4 ^m	Sp
1893.47	193.1	0.39	...	...	1 ^m	Lew
1893.58	Single	...	...	...	1 ^m	Com
1894.12	207.4	0.32	...	...	4 ^m	Bar
1894.28	203.7	0.32	...	...	2 ^m	Com
1894.48	203.7	0.29	...	...	4 ^m	Sp
1895.32	210.6	0.52	6.4...	6.5	2 ^m	Lew
1895.40	200.3	0.30	...	...	2 ^m	Sp
1895.42	212.1	0.25	...	...	4 ^m	Com
1896.37	212.5	0.4	...	...	2 ^m	Com
1896.41	212.1	0.34	...	...	2 ^m	Lew
1897.21	222.0	0.35	...	...	3 ^m	A
1897.36	223.9	0.33	...	...	2 ^m	Lew
1897.42	217.3	0.30	...	...	0 ^m	Sp
1898.32	216.9	0.48	...	...	1 ^m	Lew
1898.40	221.0	0.30	...	...	2 ^m	Lew
1898.47	225.1	0.30	...	...	2 ^m	Sp
1898.61	231.5	0.28	6.2...	6.2	3 ^m	A
1899.25	227.7	0.20	6.5...	6.5	4 ^m	A

Discovered with the 18½-inch. It was very soon apparent from the measures that this was a binary

A and C (Σ 1780 *rel.*)

1836.40	160.3	...	...	1 <i>n</i>	H
1879.33	164.7	26.94	...	2 <i>n</i>	β
1889.30	164.6	27.17	...	3 <i>n</i>	β
1899.20	164.3	27.07	...	3 <i>n</i>	β

Both components of STRUVE's rejected pair were found to be double with the 18½-inch. With a large aperture it is one of the finest of the quadruple groups.

According to AUWERS, 86 *Virginis* has a proper motion of $0^{\circ}.043$ in the direction of $287^{\circ}.5$. The measures of AB show conclusively that this movement belongs to both stars. With this proper motion and the position of B in 1879, the latter star, if fixed in space, for 1897 should be $308^{\circ}.2$ $0^{\circ}.86$. It is evident that no such relative change has taken place. The measures are insufficient in point of time to show whether or not the double companion is moving with the principal star. All the measures of AC are given above.

In making the measures of 1889 with the 36-inch, two new nebulae were discovered in the field. One is $4\frac{1}{2}^{\circ} p$ and $136^{\circ}8 s$, and the other $19\frac{1}{2}^{\circ} p$ and $101^{\circ}6 s$.

[β (XIII)... β^3 ... β^4 ... β + 2930)...Cm'...Hall (1, II)...
Aitken (3465)...]

β 801. Lalande 25399

			R.A. 13 ^h 40 ^m 43 ^s /		
			Decl. + 11° 26' \		
1881.31	328.0	2.76	8.1 . . . 10.9	3 ⁿ	β
1888.39	326.5	2.66	8.5 . . . 10.5	3 ⁿ	Com
1898.37	324.3	2.62	8.1 . . . 9.7	3 ⁿ	D)

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII) . . . β^4 . . . Comstock (*Pub. Washburn Obs.*, 11) . . . Doolittle (*Pub. Flower Obs.*, 1) . . .]

β 413. Lacaille 5686

		R.A. 13 ^h 42 ^m 16 ^s ±			
		Decl. 27° 46' N			
1877.37	109.1	78.68	7.5...	9.0	1 m C m
1879.33	108.8	78.00	6.2...	8.5	1 m β
1885.32	108.7	77.77	7.0...	8.0	1 m W
1889.39	109.5	77.66	7.7...	9.2	2 m β
1899.27	108.6	76.88	8.0...	9.0	2 m β

The distant companion to this blood-red star was noted with the 6-inch. It is not likely to be of any interest as a double star. The color of the principal star is very striking. It is not given in any of the catalogues of red stars. The measures indicate a proper motion of $\sigma^{\circ}07$ nearly in the line of the components.

[β (VII)... β (2103,2957)... β ... β (*Pub. L. O.* 11)... Cin^4 ...
Wilson (Cin^{10})...]

β 802. D.M. (49) 2245

R.A. 13^h 43^m 48^s \pm 1
Decl. $+$ 48 $^{\circ}$ 57' \pm 1

1881.33	223.9	3.43	7.8...11.0	3 ⁿ	β
1885.54	220.8	3.73	...	3 ⁿ	H Σ
1888.44	221.3	3.65	8.0...11.7	3 ⁿ	Com

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII), β^4 ... Comstock (*Pub. Washburn* (1934, VI) ... H Σ
(...)]

β 343. *Centauri* 219

R.A. 13^h 45^m S. 1
Decl. 31 1 1

1877.41	130.2	1.44	6.0...	8.5	14	Un
1889.37	129.7	1.70	6.2...	7.1	19	β
1894.45	122.0	0.93	6...	8	29	Sel
1897.22	123.0	1.05	6.4...	8.0	39	See
1898.32	118.7	1.28	6.5...	7.4	39	A

Discovered with the 6-inch. Apparently slow retrograde motion. In GOULD 6.7 m. B.A.C. 4624.

[β (v1)... β (2062,2957)... β (*Pub. L. O. II*)...Cin⁴...Sellors
(3303)...See (3496)...Aitken ()...]

β 613. D. M. (55) 2424

R.A. 15^h 40^m 3.0
Decl. \rightarrow 55 $^{\circ}$ 10' N

A and B:

1878.42	146.2	0.78	9.0...	9.00	12	β
1880.37	149.3	0.92	9.0...	9.00	14	β^3
1892.13	149.7	0.73	9.1...	9.1	32	β^3
1898.43	153.0	0.48	...	...	12	Lew
1898.44	153.5	0.87	9.0...	9.0	42	D

AB and C

1879.37	71.4	48.73	8.8	1m	β
1880.13	71.0	48.75	...	0.0	2m β
1899.37	70.9	48.73	8.9	1m	D

Discovered with the 18½-inch. It is 12.4 ϵ the 6-m star, R.A.C. 4628. Some change in the close pair is probable.

[β (XVI)... β (2400)... β (Pub. L. O. II)...Lewys & Rowe (Nat. Lit., 400)...Doolittle (Pub. Flower Obs., 1)...]

 β 1108. L.A.C. 4131

R.A. 12 50 36 1
Decl. + 35 1 1

A and B

1879.37	84.0	1.28	6.0...	6.0	3m β
1893.30	86.3	0.83	6 ...	6	2m Sp
1899.37	86.5	0.99	6.0...	6.0	3m A

AD and C

1880.38	168.2	27.42	12	1m	β
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AD and D.C. H.V. 1214

1783.68	...	54.02	...	1m	H'
1899.37	...	54.23	...	3m	β

Discovered with the 12-inch, but it had been previously seen and recorded by Howe. Lacaille 5726.

[β (XVII)... β (2056)... β (Pub. L. O. II)...Howe (Cin')...Sellars (3240)...Aitken (3465)...]

 β 614. Lalande 25573

R.A. 12 51 52 1
Decl. + 35 1 1

1878.37	...	0.60	8.0...	11.7	2m β
1889.40	271.1	...	7.0	...	2m β

This very difficult pair was discovered with the 18½-inch. The principal star is identical with that of O Σ 271, which was marked "oblonga?" in the *Poulkova Catalogue* of 1843, but rejected as single in the revised edition of 1850. It is not certain that the very minute star now measured has any connection with the suspected elongation previously noticed. At the time of making the meas-

ures given above, the principal star was perfectly round, with the 18½ and 36-inch refractors. It is the southern star of three in the field.

[β (XVIII)... β (21002087)... β (Pub. L. O. II)...]

 β 461. W. XIII, 850

R.A. 12 50 36 1
Decl. + 35 1 1

A and B

1879.38	234.9	33.33	7.5	...	12.5	1m β
1893.30	235.1	33.33	7.7	...	12.2	3m W
1899.37	235.9	33.12	7	...	12.2	2m β

A and C

1879.38	210.3	40.55	...	11.8	1m β
1893.30	216.6	40.50	...	11.3	3m W
1899.37	216.6	40.84	...	12.3	2m β

Noted with the 6-inch. Of no particular interest as a double star.

[β (XIX)... β (2100... β (2100... β (2100...Wilson (1...)]

 β 936 D.M. 435 + 2505

R.A. 12 51 52 1
Decl. + 35 1 1

1880.37	97.8	3.94	8.1	...	12.2	2m β
1892.13	95.8	4.58	8.5	...	11.3	3m β
1898.51	95.9	4.60	8.7	...	12.0	3m A

Discovered with the 18½-inch. Probably fixed.

[β (XXI)... β (3142)... β (Pub. L. O. II)...Aitken (3465)...]

 β 937. W. XIII, 1122

R.A. 12 51 52 1
Decl. + 35 1 1

1880.37	101.8	0.91	8.1	...	8.3	3m β
1890.48	108.8	0.77	...	...	...	2m Sp
1896.49	102.8	0.88	8	...	8+	3m A

Discovered with the 18½-inch. Very little, if any, change.

[β (XXII)... β (3142)... β (3142)...Aitken (3395)...]

β 344. O. Arg. S. 13285

R.A. $13^h 52^m 22^s$ $\frac{1}{2}$
Decl. $-24^\circ 57'$

1877.29	121.1	3.32	9.0...	9.0	1n	Cin
1879.27	125.7	...	9.0...	9.5	1n	Cin
1880.33	124.4	3.31	8.0...	9.0	2n	Cin
1898.32	123.8	3.44	8.7...	8.8	3n	A

Discovered with the 6-inch. There is no evidence of change.

[β (xiv)...β (2062)...Cin⁴...Cin⁵...Cin⁶...Aitken ()...]

β 30. D.M. (20) 2904

R.A. $13^h 52^m 26^s$ $\frac{1}{2}$
Decl. $+20^\circ 3'$

1875.25	199.8	7.82	8.2...	11.5	2n	J
1892.24	200.0	8.05	8.0...	10.4	3n	β
1892.29	199.6	8.29	8.0...	11.0	4n	Lv
1898.36	198.8	8.27	8.1...	11.0	2n	Gl
1898.37	197.2	8.18	8.0...	9.7	2n	D
1898.46	201.3	8.75	...	...	1n	Lew

Discovered with the 6-inch.

[β (ii)...β (Mon. Not. LIX, 400)...β (3142)...β (Pub. L. O. ii)...A (i)...Lv (A. J. 278) (Proc. Haverford Coll. Obs. 1892)...Glasenapp (v)...Doolittle (Pub. Flower Obs. 1)...Lewis (Mon. Not. LIX, 400)...]

β 1197. Lacaille 5791

R.A. $13^h 50^m 4^s$ $\frac{1}{2}$
Decl. $-31^\circ 6'$

1890.41	178.9	0.86	6.8...	8.1	3n	β
1897.37	187.9	0.93	6+...	8+	3n	Λ
1897.42	185.2	1.18	6.9...	9.2	1n	See

Discovered with the 12-inch. There may be some change in the angle.

[β (xvii)...β (3047)...β (Pub. L. O. ii)...Aitken (3465)...
See (3466)...]

β 1270. Lalande 25825

R.A. $13^h 57^m 16^s$ $\frac{1}{2}$
Decl. $+9^\circ 4'$

1892.27	329.7	0.27	8.2...	8.3	3n	β
1896.40	356.2	0.43	...	...	1n	Lew
1897.41	346.0	0.27	...	...	1n	Lew

1898.44	341.8	0.30	...	...	2n	Lew
1898.44	344.9	0.45	...	...	1n	Bow
1899.24	391.5	0.24	8.2...	8.5	3n	Λ

Discovered with the 36-inch. In D.M. 7.9 m. Change in angle appears certain, but further measures are needed.

[β (xix)...β (3141)...β (Pub. L. O. ii)...Lewis and Bowyer (Mon. Not. LIX, 400)...Aitken ()...]

β 938. O. Arg. S. 13375

R.A. $13^h 50^m 29^s$ $\frac{1}{2}$
Decl. $-26^\circ 0'$

1879.39	117.6	0.89	7.5...	7.5	2n	β
1892.40	117.1	0.65	7.9...	8.2	3n	β
1892.41	299.1	0.62	7.5...	7.7	3n	Lv
1897.42	111.5	0.72	8...	8	1n	A

Discovered with the 18½-inch. Probably unchanged. It is 6' n of π *Hydrae*.

[β (xiii)...β...β (3142)...β (Pub. L. O. ii)...Lv (A. J. 278) (Proc. Haverford Coll. Obs. 1892)...Aitken (3465)...]

β 1109. D.M. (5) 2846

R.A. $14^h 37^m 18^s$ $\frac{1}{2}$
Decl. $+5^\circ 14'$

Λ and B

1889.39	321.9	1.78	9.0...	13.7	3n	β
1899.24	314.8	1.85	9.0...	13.3	2n	Λ

Λ and C

1889.39	356.3	53.24	...	9.0	3n	β
1899.18	355.3	53.30	...	9.0	1n	Λ

Discovered with the 36-inch.

[β (xvi)...β (2956)...β (Pub. L. O. ii)...Aitken ()...]

β 803. Lalande 25091

R.A. $14^h 47^m 30^s$ $\frac{1}{2}$
Decl. $-2^\circ 4'$

1881.15	227.9	5.27	7.8...	12.8	1n	β
1892.40	229.8	5.34	7.4...	11.3	3n	β
1899.27	224.6	5.67	7.5...	11.7	2n	β

Discovered with the 14-inch. at the Washington Observatory. Another pair found at the same place in 1878.

Obs. 1878	1890.0	4.33	8.8	9.5	36	β
Obs. 1878	1890.0	4.70	9.0	9.5	26	β

[1890.0] β = 1890.000, 3.113, 1.111, 1.111

β 224. W⁺ 813. 95

R.A. 14 ^h 12 ^m 58 ^s	1
Decl. - 25° 10' 5"	1

1878.44	5.14	0.71	8.9...	9.5	36	β
1890.42	61.7	0.63	9.0...	9.5	29	Sp
1884.68	68.6	0.78	8.2...	9.5	59	En
1893.36	65.0	0.88	7.8...	9.5	39	W
1898.20	61.1	0.86			26	D
1898.32	65.6	0.69	8.3...	9.5	39	A

Discovered with the 6-inch. Change uncertain.

[β (iv)]... β (*Mon. Not.* xxxiv, 382)... β (i)...Sp (ii)...Engelmann (2678)...Wilson ()...Doolittle (*Pub. Flower Obs.* 1)...Aitken ()...

β 939. Lalande 26177

R.A. 14 ^h 12 ^m 58 ^s	1
Decl. - 25° 10' 5"	1

β 939 (i)

1890.00	133.3	0.65	8.0...	8.1	29	β
1890.00	133.3	0.45			29	Sp
1890.34	133.3	0.68	8.0...	8.4	29	13
1892.39	149.5	0.677			29	Sp
1890.00	150.0	0.813			19	Sp
1898.27	147.5	0.71	8...	8	39	D

β 939 (ii)

1890.00	280.9	0.724			19	β
1890.27	280.6	0.724			19	D

[1890.00]... β (ii) = 1890.000, 1.111, 1.111, 1.111. Apparently without change.

[1890.00]... β (iii) = 1890.000, 1.111, 1.111, 1.111. Apparently without change.

β 1246. B.A.C. 4710

R.A. 14 ^h 12 ^m 58 ^s	1
Decl. - 25° 10' 5"	1

A and B

1891.43	187.1	2.99	5.5...	13.5	39	β
1898.52	189.2	3.30	5.5...	13.5	29	A

A and C

1891.42	188.8	39.35		11	19	β
1898.44	92.0	39.09			19	β
1898.52	93.3	39.05		13.5	29	A

Discovered with the 36-inch. The principal star has a large proper motion, α 158, in the direction of 307° (PORTER). The change in the position of C is explained by this motion of A. The companion to A evidently has the same proper motion, and the two doubtless form a physical system.

LAUSANNE 5802.

[β (VIII)]... β (3113)... β (*Pub. L. O. n.*)...Aitken ()...

β 1110. Taylor 6966

R.A. 14 ^h 12 ^m 29 ^s	1
Decl. - 26° 18' 3"	1

1890.39	133.7	3.95	7.0...	12.3	39	β
1897.37	133.4	3.62	6.9...	14.2	19	See
1898.52	133.2	3.70	7.2...	14.7	39	A

Discovered with the 12-inch. So far unchanged.

[β (v)]... β (2450)... β (*Pub. L. O. n.*)...See (3496)...Aitken ()...

β 116. Lalande 26177

R.A. 14 ^h 13 ^m 3 ^s	1
Decl. - 13° 5' 3"	1

1875.69	279	2.90	7.7...	8.2	39	β
1876.38	278.7	3.21	8.0...	8.5	29	Cin
1877.14	278.2	3.08	8.0...	8.5	19	Cin
1878.42	277.1	2.98	7.7...	8.2	29	Cin
1880.37	278.3	3.08			19	Cin
1885.28	278.7	3.12	8.0...	8.5	19	W
1886.30	279.2	3.06	8...	8	19	LM
1888.36	278.6	3.16	7.7...	8.5	39	T
1888.36	277.7	3.01	8.2...	8.2	29	Lv
1890.41	279.1	3.32	7.8...	8.1	29	Gl
1893.38	276.3	3.08	7.8...	8.6	19	J

Discovered with the 6-inch. No material change.
It is 20' n of A *Virginis*.

[β (III)... β (Mon. Not. XXXIV, 59)...4 (I)...Cin³...Cin⁴...
Cin⁵...Cin⁶...Wilson (Cin¹⁰)...LM...L⁴...Tarrant
(2991)...Glasenapp (1)...Jones (*A. J.* 312)...]

β 1271. Radcliffe 3181

R.A. 14^h 13^m 42^s I
Decl. - 55° 0' V

1892.36	355.2	2.81	6.8...	12.0	3 ^m	β
1897.58	351.0	2.31	7.0...	12.0	3 ^m	A

Discovered with the 36-inch. In D.M. 7.0 m.
[β (XIX)... β (3141)... β (*Pub. L. O. II*)...Aitken (3465)...]

β 1272. O. Arg. N. 14451

R.A. 14 13^m 22^s I
Decl. - 49 48 V

A and B

1892.17	132.5	1.25	8.4...	9.5	4 ^m	β
1897.52	132.8	1.32	...	...	2 ^m	Lew
1897.56	126.5	1.14	8+	9+	3 ^m	A
1898.53	129.3	1.18	...	...	1 ^m	Lew
1898.63	134.2	1.44	...	...	1 ^m	Bry

A and C (= H 2710)

1830	324.0	25.7	0	...	10	1 ^m	H
1892.17	321.8	23.67	...	...	8.6	4 ^m	β
1898.63	321.4	23.60	...	...	...	1 ^m	Bry

The duplicity of the principal star of H 2710 was discovered with the 36-inch. Thus far there appears to be no certain change, and the same is true of the distant star. All the measures of this are given above. C is O. Arg. N. 14448.

[β (XIX)... β (3141)... β (*Pub. L. O. II*)...Aitken (3465)...
Lewis and Bryant (*Mon. Not. LIX*, 400)...]

β 1273. O. Arg. N. 14457

R.A. 14 14^m 2^s I
Decl. - 48 28 V

1892.17	193.0	1.08	8.0	9.5	3 ^m	β
1897.52	193.3	0.94	...	...	2 ^m	Lew
1897.56	187.1	1.08	9	11	3 ^m	A
1898.53	199.4	0.80	...	...	1 ^m	Lew
1898.63	193.6	...	...	...	1 ^m	Bry

Discovered with the 36-inch.

[β (XIX)... β (3141)... β (*Pub. L. O. II*)...Aitken (3465)...
Lewis and Bryant (*Mon. Not. LIX*, 400)...]

β 1111. *Plates XIV. 69*

R.A. 14^h 17^m 29^s I
Decl. + 4 6 V

B and C

1889.40	315.3	0.19	8.4...	8.4	3 ^m	β
1890.43	321.2	0.25	...	...	2 ^m	Sp
1892.17	330.1	0.21	8.2...	8.6	4 ^m	β
1898.44	330.6	0.30	...	...	2 ^m	Lew
1898.48	18.4	0.22	...	...	3 ^m	β
1898.57	19.0	0.28	8.2...	8.2	1 ^m	A

A and BC (= Σ 1835)

1832.08	186.5	0.06	5.5...	6.8	3 ^m	Σ
1853.98	189.5	6.27	4.8...	6.8	6 ^m	J
1866.72	188.4	6.24	5.7...	7.0	3 ^m	J
1885.41	187.9	0.33	4.5...	6.5	3 ^m	Per
1889.40	189.6	0.30	5.4...	...	3 ^m	β
1889.80	188.4	6.29	...	...	6 ^m	Sp
1892.17	189.3	6.25	5.0...	...	2 ^m	β
1898.48	189.5	6.38	...	...	3 ^m	β
1898.56	189.9	6.47	5.2...	8.0	3 ^m	A

The duplicity of the smaller component of Σ 1835 was discovered with the 36-inch. The measures of only nine years are sufficient to show that this is a binary in rapid motion. It will probably take a place with the short period systems. Thus far the motion has been about 7° per year, with little or no change in the distance. It is not improbable that the distance now is about maximum, and that the mean angular motion is much more rapid.

There has been no change in the position of this star with reference to A. A few of the measures are given. The principal star is B.A.C. 4766.

[β (XIX)... β (3141)... β (*Pub. L. O. II*)...Aitken (3465)...
Lewis and Bryant (*Mon. Not. LIX*, 400)...]

The wide pair, Σ 1835, is also H¹ II. 38 = Sh 177. These original catalogues, and the following include all the measures:

[Mädlar (*Fisken-Syteme* 1, II) (*Dorpat Obs.* X, XII, XIII xv)...Mädlar (324)...Dawes (*Measures at Bishop's Obs.*)...
Herschel (*General Catalogue*)...]

... See and Weillman (*Riesch Stern.* Berlin, No. 6, 1802)...
Glasenapp (1, III)...]

β 615. O. Anz. N. 14 400

R.A. 14^h 11^m 37^s 3
Decl. - 49° 45' 3"

1870.0	256.6	2.78	8.5	6.5	1.9	B
1889.38	256.4	2.84	8.5	6.5	3.0	B
1897.44	256.2	2.82	8.4	6.8	3.0	1A
1899.27	256.1	2.82	8.4	6.9	3.0	D

Discovered with the 18½-inch. Motion in angle is probable. Σ 1834 is 2" exactly preceding.

[*Proc. Haverford Coll. Obs.* 1892)... Doolittle (*Pub. Flower Obs.* 1)...]

β 225. Lalande 26320

R.A. 14^h 28^m 49^s 1
Decl. - 19° 29' 3"

found 1

1870.0	101.9	1.44	7.3	6.4	3.8	11d
1889.38	101.9	1.44	7.3	6.4	3.8	D
1897.44	101.8	1.44	7.5	6.5	3.0	Cin
1899.27	101.8	1.44	7.5	6.5	3.0	Cin
1897.44	101.8	1.66	7.2	7.9	2.0	Gl
1899.27	101.8	1.66	7.2	7.9	2.0	Gl
1897.44	101.3	1.58	7.5	8.2	4.0	A
1899.27	101.3	1.58	7.5	8.2	4.0	A

R. 1800 B. 11 N. 80 = Sh 179)

1870.0	295.8	2.41	7	7	3.0	B
1889.38	295.7	2.41	7	7	3.0	B
1897.44	295.5	2.41	6.0	7	3.0	D
1899.27	295.4	2.41	6.0	7	3.0	D

The close pair was discovered with the 6-inch. It is found, however, in the subsequently published observations of the Harvard Observatory.

There is no change in AB, and very little, if any, in the close pair. This is a naked-eye star in *Virgo*, according to HEIS, but GOULD places it in *Libra*. All the measures of the wide pair are given above.

[β (IV)... β (*Mon. Not.* XXXIV, 382)... J (1)... Cin⁴... Cin⁶...
Annals Harvard Obs. XIII... Glasenapp (1)... Jacob (*Mem. R. A. S.* XVII)... Sellors (3240)... Doolittle (*Pub. Flower Obs.* 1)...]

β 040. 52 *Hydrae*

R.A. 14^h 24^m 34^s 1
Decl. - 28° 57' 3"

1870.0	276.8	4.80	5.0	11.3	3.0	B
1889.38	278.7	4.27	5.0	10.8	3.0	B
1897.44	278.7	5.37	5.0	10.3	2.0	See
1899.27	277.5	4.37	5.0	11.0	2.0	B

Discovered with the 18½-inch. The principal star has a proper motion of 0.063 in the direction of 228°.4. It is probable that the companion is moving with it, as otherwise the distance would be less at the date of the last measures, and the angle nearly 15° more than it was in 1879.

[β (VII)... β (18257)... *Proc. L. O. O.*... See 33960...]

β 462. S.D. (3¹) 3635

R.A. 14^h 24^m 34^s 1
Decl. - 31° 11' 3"

A and B

1870.0	324.4	2.01	9.5	9.7	2.0	J
1889.38	328.9	1.96	9.0	9.3	1.0	B
1897.44	325.1	2.10	9.1	9.1	3.0	B
1899.27	325.4	2.22	9.0	9.2	1.0	D

A and C

1880.32	65.4	14.31	12.0	1.0	B
1898.36	66.5	13.33	9.0	1.0	D

Discovered with the 18½-inch.

[β (VIII)... β (18257)... *Proc. L. O. O.*... See 33960...]

β 117 Lalande 26481R.A. $14^h 24^m 43^s$ l
Decl. $-15^{\circ} 4' N$

1867.37	96.6	2.16	...	1 ⁿ	Hd
1866.64	95.8	2.44	8.3... 9.2	3 ⁿ	J
1877.11	93.8	2.05	8.0... 9.0	1 ⁿ	Cin
1879.39	96.0	...	8.0... 9.0	1 ⁿ	Cin
1880.33	91.4	2.18	7.8... 8.5	1 ⁿ	β
1880.38	92.0	2.41	7.5... 8.5	1 ⁿ	Cin
1883.42	95.4	2.30	...	2 ⁿ	Hl
1883.46	92.9	2.17	...	1 ⁿ	β
1884.41	95.3	2.36	...	3 ⁿ	Hl
1886.35	93.7	2.58	7.5... 8.5	1 ⁿ	W
1888.35	92.9	2.26	8.0... 9.0	2 ⁿ	T
1888.39	90.4	2.29	8.2... 8.9	2 ⁿ	Lv
1890.44	96.6	2.53	8.1... 8.8	2 ⁿ	Gl
1898.43	93.0	2.24	7.4... 8.8	4 ⁿ	D

Discovered with the 6-inch. There is no relative motion, but it is undoubtedly a physical system, as the components have same large proper motion of 0.424 in the position-angle of $153^{\circ}2$ (PORTER). This pair had been previously seen by the Harvard observers, but not published until long after β (III).

[β (III)...β (*Mon. Not. XXIV*, 50... 51, *Annals Harvard Obs.*, XIII... Cin⁴... Cin⁵... Hall (II)... Wilson (Cin²⁰)... Tarrant (2991)... Lv¹... Glasenapp (I)... Doolittle (*Pub. Flower Obs.*, I)...]

β 1112. Lacaille 5893R.A. $14^h 26^m 3^s$ l
Decl. $-30^{\circ} 11' N$

1889.41	7.6	2.44	6.3... 11.1	6 ⁿ	β
1897.37	3.1	2.46	...	3 ⁿ	A
1897.41	7.7	2.66	5.8... 12.4	2 ⁿ	See

Discovered with the 12-inch. In GOULD 6.4 m.
[β (XVI)...β (2950)...β (*Pub. J. O. II*)... Aitken (3465)... See (3496)...]

β 238. Lalande 26529R.A. $14^h 27^m 1^s$ l
Decl. $-20^{\circ} 30' N$

1877.39	90.3	6.96	8.2... 10.2	2 ⁿ	Cin
1893.42	91.1	6.94	8.4... 10.5	2 ⁿ	W
1893.47	90.6	6.94	...	1 ⁿ	Lv

Discovered with the 6-inch. Unchanged.

[β (V)...β (*Mon. Not. XXV*, 31)... Cin⁴... Lv... Wilson (...)]

β 616. γ BootisR.A. $14^h 27^m 15^s$ l
Decl. $+38^{\circ} 50' N$

1878.25	98.6	26.18	2.8... 12.5	2 ⁿ	β
1891.24	103.6	28.23	...	13.8	3 ⁿ β
1898.27	105.5	29.38	...	13.0	2 ⁿ β
1898.28	102.2	29.37	...	...	1 ⁿ D

The faint companion was detected with the $18\frac{1}{2}$ -inch. AUWERS gives the proper motion of γ Bootis 0.198 in the direction of $320^{\circ}5$. This movement and the position of the companion given by the measures of 1878 give for the date of the measures in 1898, $103^{\circ}8; 29^{\circ}33$. It is therefore evident that this is only an optical companion. The minimum distance of 19.5 occurred in about 1780.

[β (X)...β¹...β (3114)...β (*Pub. L. O. II*)... Doolittle (*Pub. Flower Obs.*, I)...]

β 941. Lalande 26605R.A. $14^h 29^m 40^s$ l
Decl. $-0^{\circ} 46' N$

1879.28	218.3	0.80	8.2... 8.2	1 ⁿ	β
1888.31	40.2	0.80	8.4... 8.5	2 ⁿ	Lv
1888.80	222.1	0.6±	...	3 ⁿ	Sp
1893.40	216.8	0.83	8.7... 8.8	3 ⁿ	W
1893.96	215.5	0.7±	...	2 ⁿ	Sp
1897.41	223.0	0.5±	...	1 ⁿ	Sp

Discovered with the $18\frac{1}{2}$ -inch. Evidently unchanged.

[β (XIII)...β¹...Lv¹...Sp (III)...Wilson (...)]

β 804. W' XIV. 558R.A. $14^h 31^m 42^s$ l
Decl. $-8^{\circ} 9' N$

1881.46	166.2	1.40	8.1... 12.7	2 ⁿ	β
1888.74	159.5	1.39	8.5... 13.8	2 ⁿ	Com
1891.20	160.9	1.29	8.4... 11.5	3 ⁿ	β
1898.39	164.9	1.37	7.8... 9.7	3 ⁿ	D

Discovered with the $15\frac{1}{2}$ -inch at the Washburn Observatory. No sensible change.

[β (XII)...β¹...β (3114)...β (*Pub. L. O. II*)... Comstock (*Pub. Washburn Obs.*, VI)... Doolittle (*Pub. Flower Obs.*, I)...]

β 1226. Lacaille 2005

R.A. 12 02 08 S
Decl. - 21 28 A

1800.10	10.3	0.80	7.5...	7.5	3m	Sp
1802.11	80.4	1.01	7.5	8.2	2m	Cin
1804.12	10.1	0.95	7.8...	8.0	1m	β
1805.14	8.1	0.99	8.0...	8.0	1m	Cin
1884.35	84.7	1.01	8.5...	8.7	2m	W
1899.29	87.6	0.0 \pm	7.7...	8.0	4m	Gl

Discovered with the 6-inch. There may be a slow advance in the angle.

[β (v)... β (low. No. XXXIV, 382)... β ...Sp (1)...Cin⁶...
Cin⁵...Cin⁴...Wilson (Cin¹⁰)...Glaspenn (1)...]

 β 805. α Aitken 11700

R.A. 12 52 28 S
Decl. - 20 37 A

A and B

1800.11	11.4	24.12	7.2...	13.0	2m	β
1802.11	114.5	28.40	7.2	11.5	2m	Com
1899.29	133.8	28.47			2m	β

C and D

1881.44	0.50	1.99	9.2	11.7	3m	β
1899.29	24.4	1.99	9.2	11.2	1m	Com

A and E

1800.11	42.0	123.98			3m	β
1888.41	42.0	123.45			1m	Com
1899.29	41.4	124.38			2m	β

Discovered with the 15½-inch at the Washburn Observatory.

(low. No. 200) Comstock (Pub. Washburn Obs. vi)...]

 β 806. α Aitken 11711

R.A. 12 53 27 S
Decl. - 20 45 A

A and B

1800.11	00.1	0.67	7.3...	9.3	3m	β
1802.11	07.1	0.69	7.2...	9.8	3m	A

C and D

1800.11	10.1	1.22	8.5...	9.2	3m	β
1802.11	144.7	1.20	8.5...	9.2	3m	β
1805.14	100.0	1.21	8.5...	10.2	3m	A

A and C

1881.42	67.4	71.50			3m	β
1802.11	67.3	71.48			3m	β
1809.32	66.7	71.75			1m	β
1809.38	67.2	71.97			1m	A

A and g

1890.38	329.6	17.78	...	13.5	2m	β
1899.34	327.2	16.91	...	14.5	3m	A

The duplicity of the smaller member of the wide pair was discovered with the 15½-inch at the Washburn Observatory; and in measuring that with the 36-inch the other star was found to be a still closer pair, thus forming an apparently interesting quadruple group.

[β (xii)... β ... β (3048)... β (Pub. L. O. ii)...Aitken (...)]

 β 345. Lacaille 6051

R.A. 14^h 34^m 40^s E
Decl. - 29 11 A

1875.41	339.6	...	7.0...	7.0	1m	β
1877.41	128.2	0.94	7.0...	7.3	1m	Cin
1880.42	299.4	0.90	7.8...	8.5	1m	Cin
1892.37	303.5	0.94	7.5...	8.2	3m	β
1897.45	341.9	0.98	7+...	8	3m	A
1897.50	303.7	0.92	7.2...	8.1	2m	See

Discovered with the 6-inch. Change is doubtful.

[β (vi)... β (2062,3142)... β (Pub. L. O. ii)...Cin⁴...Cin⁶...
Aitken (3465)...See (3496)...]

 β 414. Centauri 315

R.A. 14^h 34^m 42^s E
Decl. - 30 25 A

1889.43	315.6	1.01	6.5...	7.9	3m	β
1896.49	346.5	0.90	6.7...	8.0	4m	A
1897.39	342.5	0.86	6.0...	8.2	1m	See
1897.45	344.9	0.89	6+...	8	3m	A

Discovered with the 6-inch. So far without change. In GOTT 6.6 m. LACAILLE 6052.

[β (xiii)... β (210,32957)... β (Pub. L. O. ii)...Glaspenn (1)
...Aitken (3395,3465)...See (3496)...]

β 807. Schj. 5216

R.A. 14^h 36^m 37^s $\frac{1}{2}$
Decl. 6 18 $\frac{1}{2}$

1881.41	239.0	1.24	8.0...	9.1	3 ^m β
1888.46	241.0	1.15	8.0...	9.0	1 ^m Lv
1888.46	237.2	1.10	8.5...	9.7	3 ^m Com

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)... β^4 ...Lv⁴...Comstock (*Pub. Washburn Obs.*, vi)...]

β 1113. B.A.C. 4886

R.A. 14^h 11^m 21^s $\frac{1}{2}$
Decl. + 2 32 $\frac{1}{2}$

1889.40	137.1	4.54	6.2...	11.8	3 ^m β
1898.39	136.0	4.37	7.0...	12.0	2 ^m β
1898.40	136.4	4.14	6.0...	12.0	3 ^m A

Discovered with the 36-inch. The magnitude in D.M. is 7.7.

[β (xvi)... β (2956)... β (*Pub. L. O. II*)...Aitken ()...]

β 346. *Librae* 23

R.A. 14^h 41^m 50^s $\frac{1}{2}$
Decl. 16 50 $\frac{1}{2}$

1877.41	236.2	1.23	7.2...	7.9	2 ^m Cin
1877.44	236.1	1.27	7.2...	8.0	2 ^m J
1879.34	233.2	1.27	7.0...	8.0	1 ^m Cin
1890.98	239.2	1.18	7.0...	8.0	2 ^m Sp
1888.35	233.4	1.27	7.0...	8.0	3 ^m T

Discovered with the 6-inch. No material change. Lalande 26940.

[β (vi)... β (2662)... Δ (i)...Cin⁴...Cin⁵...Sp (ii)...Tarrant (2991)...]

β 617. Lalande 26952

R.A. 11^h 42^m 23^s $\frac{1}{2}$
Decl. 23 45 $\frac{1}{2}$

B and C

1878.34	336.6	2.73	8.5...	11.5	2 ^m β
1880.38	337.2	2.14	8.8...	11.5	2 ^m Cin
1897.50	335.3	2.57	8...	11.2	1 ^m See
1898.39	334.5	2.52	8.3...	11.2	3 ^m A

A and B = H¹ VI. 117 S 6631

1825.35	219.1	56.69	7.5...	10	2 ^m S
1878.34	219.5	59.44	6.5...		2 ^m β
1898.39	219.8	60.44	6.2...		3 ^m A

The smaller star of HERSCHEL's wide pair was found to be double with the 18½-inch. The measures show no change in the last twenty years. All the measures of AB are given above. There would seem to be an increase in the distance, implying a proper motion of about 0.05 in a direction nearly opposite B. There is an error of 16' in the declination of this star in H¹.

[β (x)... β^4 ...Cin⁴...See (3496)...Aitken ()...]

β 106. μ *Librae*

R.A. 14^h 42^m 45^s $\frac{1}{2}$
Decl. 13 39 $\frac{1}{2}$

A and B

1874.29	345.0	1.54	...		1 ^m WS
1875.60	335.0	1.38	5.4...	6.3	5 ^m J
1876.99	335.1	1.53	5.5...	6.2	2 ^m Sp
1877.40	334.7	1.69	5.0...	7.0	2 ^m Cin
1878.32	333.2	1.50	5.5...	6.3	1 ^m β
1879.35	335.0	2.02	5.5...	7.0	2 ^m Cin
1883.43	337.4	1.51	5.4...	6.6	6 ^m En
1885.28	337.0	1.56	5.0...	7.0	1 ^m W
1886.39	337.2	1.52	5.0...	6.3	4 ^m T
1888.35	339.2	1.63	6.0...	7.2	5 ^m Lv
1889.38	340.6	1.61	5...	6	3 ^m β
1889.46	339.6	1.84	5.5...	6.5	4 ^m T
1890.41	330.0	2.01	6.0...	8.0	2 ^m Gl
1897.29	343.5	1.84	5.4...	6.3	2 ^m D
1897.41	340.2	1.57	5+	...	3 ^m A
1898.12	344.8	1.58	5½...	6½	2 ^m Sc
1898.55	339.6	1.59	5.5...	6.0	3 ^m A

A and C

1889.38	283.7	18.33	...	14.5	2 ^m β
1898.52	281.6	17.98	...	15.0	2 ^m A

A and D

1889.38	185.5	25.00	...	13.9	3 ^m β
1898.52	184.8	26.20	...	14.0	2 ^m A

A and E

1878.32	220.2	27.35	...	12.5	1 ^m β
1889.38	232.5	27.10	...	12.8	3 ^m β
1898.51	232.8	27.46	...	13.5	2 ^m A

The close pair was discovered with the 6-inch, the distant star E with the 18½-inch, and the faint companions, C and D, added with the 36-inch. The large star has a proper motion of 0.097 in the direction of 200.0 (AUWERS), and it is obvious that this belongs to both components. It is probable that the distant companions are not attached

(1875-90) ... J (2081) ... Sp (11) ... Cin ... Engelm (2078) ... Wilson (Cin) ... Tarrant (2860, 3186) ... Lvt ... Ly (Sol. Mot. VIII, 77) ... Glasenapp (1) ... Dou ... (Mon. Not. LIV, 317; LIX, 400) ... Aitken (3395) ...]

β 31. *Libra* 3.06

R.A. 12 22 00
Decl. + 19 00

5 400 5

1875.25	1875.25	1.11	8.5...	10.2	20	J
1878.24	187.8	1.29			10	β
1880.43	188.4	1.40	8.5...		10	β
1883.71	188.1	1.55	8.0...	10.2	50	Lv
1890.35	189.0	1.40	8.4...		30	β
1901.00	192.7	1.35			50	Sp
1903.50	196.3	1.87			40	Lew
1908.10	192.1	1.05			40	A
1908.30	192.1	1.40			30	Lew
1897.44	193.7	1.52			10	Bow
1898.45	196.2	1.48			10	Lew

A and B

1878.25	191.0	9.04	12.5	10	β
1890.35	192.7	10.1	12.2	30	β
1901.00	194.1	10.0		20	Lew
1908.46	196.0	9.05		30	Lew

The close pair was discovered with the 6-inch, and C subsequently added with the 18½-inch. The *Berlin A. G. Catalogue* gives the principal star a proper motion of 0.230 in the direction of 347.9 (FORBES 0.223 in 343.0). The measures show conclusively that the movement is common to the three components, and there can be no doubt that they constitute a physical system. There is slow direct angular motion in the close pair, and, perhaps, some

change in the direction of C. This triple is about 31' sf ε Bootis.

[β (1) ... (Mon. Not. XXXIII, 351) ... β (3048) ... β (Pub. L. O. II) ... J (1) ... Engelm (2078) ... Sp (11) ... Lewis (Mon. Not. LIV, 317; LIX, 400) ... Aitken (3395) ...]

β 118. *O. Aves* N. 14034

R.A. 14 47 11
Decl. + 10 14

1875.90	37.4	1.83	9.8...	10.7	20	J
1879.87	306.1	1.86	8.5...	10.0	20	Cin
1886.30	308.6	1.95	8.0...	9.0	10	LM
1888.35	306.4	1.50	10.0...	10.5	20	T

Discovered with the 6-inch. Without change. It is 21.2' J and 28' S of a *Librae*.

[β (11) ... β (Mon. Not. XXXIV, 50) ... J (1) ... Cin ... Cin ... L.M. ... Tarrant (2991) ...]

β 347. *Centauri* 330

R.A. 14 17 08
Decl. - 32 40

A and B

1880.45	320.0	13.01	6.5...	10.5	30	β
1890.43	319.9	13.17	6.0...	10.2	10	Gl
1897.39	318.1	12.91	6+...	1.0	20	A

A and C

1880.45	243.1	58.40		9.8	30	β
1890.43	243.1	58.34			20	Gl
1897.39	242.8	58.64		10	20	A

Discovered with the 6-inch. B.A.C. 4912. The measures of C indicate a small proper motion.

[β (31) ... β (2062) ... β (2957) ... β (Pub. L. O. II) ... Glasenapp (1) (A. J. 241) ... Aitken (3465) ...]

β 942

R.A. 14 47 29
Decl. - 6 24

1879.44	189.9	1.24	9.2...	9.2	20	β
1892.30	191.2	1.26	9.2...	9.3	30	β
1892.38	189.8	1.02	9.1...	9.2	40	Lv
1897.44	200.1	0.94			10	Lew

Discovered with the 18½-inch. Not in the D.M. It is 187^s from the wide pair, OΣ (app.) 131, in the direction of 221°5. This wide pair is

210.5 : 89°69 : 6.5...7.2 (1873.44) 2ⁿ J

[β (XIII)...β¹...β (3142)...β (Pub. L. O. II)...Lv (A. J. 278) (Proc. Haverford Coll. Obs., 1892)...Lewis (Mon. Not. LIX, 400)...]

β 239. 59 Hydræ

R.A. 14^h 51^m 33^s t
Decl. - 27 10' V

1874.50	303.7	0.8±	6.0...	6.0	5 ⁿ β
1878.36	309.5	0.93	6.0...	6.0	1 ⁿ β
1878.96	312.6	0.77	6.0...	6.0	2 ⁿ Sp
1879.40	310.1	0.89	...	...	2 ⁿ Cin
1879.92	311.8	0.83	6.0...	6.2	2 ⁿ β
1880.38	307.4	0.90	6.2...	6.7	4 ⁿ Cin
1881.40	312.0	1.07	6.0...	6.0	4 ⁿ β
1884.39	313.8	1.20	7.0...	7.5	1 ⁿ W
1888.43	308.3	0.96	6.0...	6.0	1 ⁿ Lv
1889.44	311.4	0.86	5.8...	5.9	3 ⁿ β
1897.51	315.8	0.92	6.8...	7.9	2 ⁿ See
1898.28	316.5	0.99	5.5...	6.0	3 ⁿ A

Discovered with the 6-inch. The angle is probably increasing, but the motion is very slow. The distance seems to have remained practically constant. AUWERS gives the proper motion of this star, 0.085 in the direction of 234°8. It is evident from the measures that this movement is common to the components, and that they must form a physical system. If one component was fixed in space, the relation in 1898 should be 31.5 : 1°89.

[β (V)...β (Mon. Not. XXXV, 31)...β¹...β²...β³...β (2057) ...β (Pub. L. O. II)...Sp (II)...Cin⁵...Cin⁶...Wilson (Cin¹⁰)...Lv¹...Lv (Sid. Mess. VIII, 77)...See (3496)...Aitken ()...]

β 808. S.D. (8) 3872

R.A. 14^h 51^m 53^s t
Decl. - 8 13' V

A and B

1881.44	201.5	0.63	9.0...	9.9	2 ⁿ β
1893.49	200.6	0.64	9.0...	9.9	1 ⁿ W

AB and C

1881.41	305.1	94.60	...	8.9	2 ⁿ β
1888.51	305.6	93.86	8.7...	8.4	3 ⁿ Com
1893.40	305.6	93.21	9.0...	8.5	3 ⁿ W
1899.26	305.7	93.47	9.0...	9.2	3 ⁿ β

Discovered with the 15½-inch at the Washburn Observatory. C is S.D. (8°) 3871. The measures indicate a proper motion of one of the wide stars of 0.06, nearly in the direction of the other. This is confirmed by the meridian positions in S.D., which give a distance of 101" for 1855.

[β (XII)...β¹...Comstock (Pub. Washburn Observatory VI)...Wilson ()...]

β 1085. Piazzi XIV. 229

R.A. 14 52^m 37^s t
Decl. - 1 30' V

1889.30	19.5	9.34	6.0...	13.2	3 ⁿ β
1898.31	21.0	9.44	6.0...	13.5	2 ⁿ A
1899.27	20.7	9.30	6.5...	13.1	1 ⁿ β

Discovered with the 36-inch. This star has a proper motion, according to PORTER, of 0.413 in the direction of 254°7. The short interval covered by the measures is sufficient to show that the new star is moving with the other. If fixed in space, the position of the companion at the date of the second measures would be 34.4 : 11°87. This is a naked-eye star in *Libra*.

[β (XX)...β (2020)...β (Pub. L. O. II)...Aitken ()...]

β 348. 2 Serpentis

R.A. 14^h 58^m 40^s t
Decl. + 30 20' V

1875.75	114.9	0.47	5.1...	7.4	4 ⁿ J
1876.44	118.3	0.67	6.0...	6.8	2 ⁿ OΣ
1876.50	119.0	0.52	5.0...	7.5	4 ⁿ Sp
1877.51	123.3	0.42	...	...	2 ⁿ Sp
1878.36	121.4	0.51	...	...	1 ⁿ β
1879.92	114.5	0.47	6.0...	7.2	2 ⁿ β
1881.41	119.7	0.45	6.0...	7.8	3 ⁿ β
1884.40	119.2	...	7.0...	8.0	2 ⁿ W
1885.53	119.7	0.50	...	...	2 ⁿ HΣ
1887.45	118.3	0.48	5.0...	7.5	3 ⁿ T

1887.4	110.7	0.54	50	111
1887.60	110.7	0.53	75	Sp
1888.53	120.0	0.52	5.0	8.5 35 T
1889.31	110.0	0.76	6.0	6.7 25 B
1897.49	111.7	0.70	6	7 35 A

Discovered with the 6-inch. There has been but little change in either angle or distance. AUWERS gives this star a proper motion of 0.010 in the direction of 188.5. The annual change is very small, and, perhaps, somewhat uncertain. If substantially correct, and it belongs to the larger star only, it would produce a diminution in the position-angle of 27' in the interval between the measures of 1875 and 1897, the distance remaining practically unchanged. There can be no doubt of the physical relation of these stars, but the period will certainly be long. There is a 13.5 m star,

03 13 13.5 O 13.5 13.5 13.5

One of HERSCHEL'S wide pairs, H⁺ VI. 51, is erroneously called 2 *Serpentis*. It is 1 *Serpentis*, a 4.5 m star, 2.5 m star, and 2.5 m star.

... J (1) ... J (2085) ... OZ (Poulkova Obs. X) ... Sp (11)
... Wilson (Cin) ... Hall (1, 11) ... Tarrant (2899, 2991)
... Anken (1495) ... HZ (1) ...]

β 110. Lalande 27434

R.A. 12^h 10^m 10^s 10^s
Decl. = 22° 16' N

1875.90	118.4	1.51	8.0...	8.5 30 J
1878.60	111.1	1.41	8.0...	9.0 30 Cin
1887.45	108.1	1.30	8.0...	8.5 30 T
1888.33	105.3	1.30	8.0...	8.5 40 T
1888.45	106.4	1.40	7.0...	8.4 20 Lv
1890.30	105.7	1.78	8.1...	8.6 20 G
1892.35	107.7	1.47	8.0...	8.5 30 Lv
1893.07	108.2	1.52		20 Sp
1893.30	104.6	1.90	8.0...	8.7 70 D
1895.47	105.4	1.48		20 Sp

Discovered with the 6-inch. The measures indicate some motion in angle.

... J (1) ... J (2085) ... OZ (Poulkova Obs. X) ... Sp (11)
... Wilson (Cin) ... Hall (1, 11) ... Tarrant (2899, 2991) ... Glase
... Anken (1495) ... HZ (1) ...]

β 1080. 47 *Boötis*

R.A. 15^h 10^m 27^s 1^s
Decl. = 48° 37' N

1889.21	250.6	0.03	5.5	13.2 30 β
1898.49	254.1	6.31	...	30 β

Discovered with the 36-inch. It is practically certain from the measures already made that this is a physical system. The bright star has a proper motion of 0.080 in the direction 277°. If the small star was fixed, this movement with the position of the companion in 1889 would give 253° 8' 5.33 for 1898. It is obvious from the measures that there has been no such change in the distance.

[β (xv) ... β (2929) ... β (Pub. L. O. 11) ...]

β 349. Lalande 27579

R.A. 15^h 20^m 52^s 1^s
Decl. = 22° 16' N

1870.43	39.3	4.17	7.0...	10.0 10 OZ
1876.51	39.6	4.06	7.5...	11.8 10 J
1876.51	39.7	3.96	8...	12 30 III
1884.42	40.9	3.83	...	30 III
1886.44	39.3	4.04	...	10 HZ
1892.39	36.2	3.80	8.0...	11.9 20 Lv
1899.27	39.2	3.62	8.0...	10.0 10 β

Discovered with the 6-inch.

[β (vi) ... β (2062) ... J (1) ... Hall (1, 11) ... OZ (Poulkova Obs. X) ... HZ (1) ... Lv (A. J. 278) (Proc. Haverford Coll. Obs. 1892) ...]

β 809. S.D. (22) 3908

R.A. 15^h 10^m 31^s 1^s
Decl. = 22° 16' N

1881.36	120.1	1.47	8.0...	9.3 40 β
1888.51	123.5	1.75	8.2...	10.0 30 Com
1892.40	119.2	1.64	8.1...	10.1 20 Lv
1898.47	122.5	1.68	8.0...	9.8 20 D

Discovered with the 15½-inch at the Washburn Observatory. No material change. The magnitude in S.D. is 8.3.

[β (xii) ... β ... Comstock (Pub. Washburn Obs. vi) ... Lv (A. J. 278) (Proc. Haverford Coll. Obs. 1892) ... Doolittle (Pub. Flower Obs. 1) ...]

β 618. 24 (ν) *Librae*R.A. $15^{\text{h}} 5^{\text{m}} 23^{\text{s}}$ ℓ
Decl. $-19^{\circ} 20' \lambda$

B and C

1878.34	24.3	1.86	10 ... 10	3 ⁿ	β
1879.96	23.4	1.74	10.0 ... 10.7	2 ⁿ	β
1885.33	19.8	1.40	10.5 ... 11.2	1 ⁿ	W
1896.46	19.1	1.68	10 ... 10	5 ⁿ	A
1899.30	17.4	1.70	...	2 ⁿ	β

A and B ($-H^1$ VI. 44 = Sh 376)

1782.39	112.5	59.07	...	1 ⁿ	H ¹
1822.84	111.6	66.50	6 ... 11	1 ⁿ	Sh
1878.33	110.5	57.46	...	3 ⁿ	β
1879.96	110.8	57.26	...	2 ⁿ	β
1885.33	110.3	57.78	4.5 ...	2 ⁿ	W
1896.44	111.0	58.23	...	2 ⁿ	A
1899.30	111.0	57.48	...	2 ⁿ	β

The duplicity of the Herschel companion was discovered with the 18½-inch. There may be a slow diminution in the angle.

All the measures of the wide pair are given above. According to AUWERS the principal star has a proper motion of $0''.067$ in the direction of $231^{\circ} 3$. This does not fully explain the change in B. The distance in the early measures would represent not B, but BC. The distance in Sh is printed $50''.63$, but SADLER has shown (*Eng. Mech.* xxxviii, 65) that the micrometer readings were wrongly reduced, and that the distance should be $66''.50$. The principal star was found to be variable by the Harvard observers.

[β (X)... β ... β ... Wilson (Cin⁵)... Aitken (3365)...] **β 350.** B.A.C. 5020R.A. $15^{\text{h}} 8^{\text{m}} 29^{\text{s}}$ ℓ
Decl. $-27^{\circ} 9' \lambda$

1876.52	163.2	1.31	6.5 ... 8.0	2 ⁿ	III
1879.46	158.1	1.15	7.0 ... 8.0	2 ⁿ	Cin
1883.40	160.3	1.34	6.5 ... 8.2	2 ⁿ	W
1886.49	157.7	1.28	...	3 ⁿ	III
1892.41	160.2	1.15	7.2 ... 8.4	2 ⁿ	Lv
1897.48	154.1	0.95	7.1 ... 8.5	1 ⁿ	See
1898.49	155.9	1.24	6.2 ... 8	3 ⁿ	Sc

Discovered with the 6-inch. Change is uncertain. In GOULD 6.9 m.

[β (vi)... β (2062)...Cin⁵...Cin⁶...Wilson (Cin¹⁰)...Hall (i, ii)...Glaserapp (i)...*J. J. 2750*...*Proc. Haverford Coll. Ohio*, 1892)...See (3496)...Scott (*Mem. Nat. Lit.*, 427)...]

 β 351. O. Arg. S. 14417R.A. $15^{\text{h}} 10^{\text{m}} 26^{\text{s}}$ ℓ
Decl. $-15^{\circ} 8' \lambda$

A and B

1876.56	303.3	10.36	9.5 ... 12	1 ⁿ	H1
1884.46	302.9	10.91	9.5 ... 12	3 ⁿ	H1
1896.49	302.0	10.75	8.5 ... 12	2 ⁿ	Lv
1899.27	303.3	10.53	8.1 ... 10.7	3 ⁿ	β

A and C

1899.26	235.0	33.36	... 12.0	1 ⁿ	β
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Discovered with the 6-inch. Apparently fixed.

[β (vi)... β (2062)...Hall (i, ii)...Lv (*A. J.* 407)...] **β 352.** O. Arg. S. 14427R.A. $15^{\text{h}} 10^{\text{m}} 42^{\text{s}}$ ℓ
Decl. $-26^{\circ} 33' \lambda$

1879.40	66.9	14.10	7.7 ... 9.7	2 ⁿ	Cin
1880.36	65.1	14.37	7.8 ... 9.0	3 ⁿ	Cin
1890.42	68.1	13.17	8.2 ... 9.6	2 ⁿ	Gl
1892.41	68.3	13.95	8.1 ... 9.2	2 ⁿ	Lv

Discovered with the 6-inch. Apparently fixed.

[β (vi)... β (2062)...Cin⁵...Cin⁶...Glaserapp (i)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Ohio*, 1892)...] **β 227.** B.A.C. 5030R.A. $15^{\text{h}} 12^{\text{m}} 7^{\text{s}}$ ℓ
Decl. $-23^{\circ} 50' \lambda$

1874.40	184.1	1.7	7.0 ... 10.5	3	
1876.47	180.9	1.08	7.0 ... 9.0	1 ⁿ	Cin
1878.44	179.2	1.06	7.5 ... 10.0	2 ⁿ	Cin
1880.42	180.2	1.00	7.0 ... 10.5	1 ⁿ	Cin
1886.30	177.5	2.28	8 ... 9	1 ⁿ	LM
1890.40	176.7	2.31	7.7 ... 8.6	2 ⁿ	Gl
1896.44	176.8	1.80	...	2 ⁿ	Sc
1898.05	177.8	1.07	7.1 ... 8.4	SB	D

Discovered with the 6-inch. No certain change. In the field with 3 228.

[β (IV)... β (*Mon. Not. XXXIV*, 382)...Cin⁴...Cin⁵...Cin⁶...
 ...*Proc. Haverford Coll. Obs.* (1892)...]
 ...Doolittle (*Pub. Flower Obs.* 1)...]

β 043. *1855 1858*

R.A. 15^h 41^m 46^s 1
 Decl. - 21° 54' 30"

1855.00	0.18	2.8	0.0	12.2	35	β
1855.00	0.21	2.03	0.2	12.3	36	β
1855.00	0.41	3.00	0.7	12.5	39	β

Discovered with the 18 $\frac{1}{2}$ -inch. Near δ *Serpentis*.

[β (III)... β (2030)... β (*Pub. L. O.* 11)...]

β 228. *1855 1858*

R.A. 15^h 41^m 38^s 1
 Decl. - 21° 54' 30"

1876.05	329.6	2.4	7.5...	7.9	29	Cin
1876.05	329.4	1.14	...	...	...	W
1886.30	328.4	7	...	...	...	1.M
1892.40	327.6	0.98	7.2...	8.1	26	1.V
1898.48	...	1.02	8.1...	8.7	26	1

Discovered with the 6-inch in looking for H 4756, which is given by HERSHEL (*Cape Observations*), 1805 \pm 23' : 9...9 $\frac{1}{2}$ ', with the note, "requires verification." His place is substantially the same as that given here, but the magnitude is very different from that of B.A.C. 5041, which is at least 7 $\frac{1}{2}$, and his estimated angle and distance do not correspond with the star measured. The measures of the new pair do not so far show any material change. β 227 is in the field ρ .

[β (IV)... β (*Mon. Not. XXXIV*, 382)...Cin⁴...Cin⁵...Wilson
 (Cin⁶)...1.M...1.V (*A. J.* 778) (*Proc. Haverford Coll.*
 1892)...1898 (*Proc. Flower Obs.* 1)...]

β 353. *1855 1858*

R.A. 15^h 41^m 38^s 1
 Decl. - 21° 54' 30"

1855.00	0.18	2.8	0.0	12.2	35	β
1855.00	0.21	2.03	0.2	12.3	36	β
1855.00	0.41	3.00	0.7	12.5	39	β

Discovered with the 6-inch. One of a wide pair

[β (IV)... β (*Mon. Not. XXXIV*, 382)...Cin⁴...Cin⁵...Cin⁶...
 ...*Proc. Haverford Coll. Obs.* (1892)...]

β 32. *6 Serpentis*

R.A. 15^h 41^m 38^s 1
 Decl. - 21° 54' 30"

1875.40	14.8	3.11	4.5...	1.0	19	III
1875.43	13.2	2.28	4.7...	0.3	49	J
1876.43	0.3	2.81	6.0...	0.5	16	O Σ
1879.40	13.6	2.37	5.7...	10.0	29	β
1885.49	14.1	2.27	4.7...	0.6	39	T
1886.44	12.7	...	...	...	19	II Σ
1887.34	15.6	2.39	5.0...	0.5	29	T
1888.44	13.8	2.78	4.5...	0.5	19	1.V
1888.52	16.2	2.68	4.5...	0.5	29	T
1889.30	17.9	2.44	5.8...	10.0	39	β
1897.48	11.6	2.38	6.0...	10.0	39	A
1898.20	14.5	2.63	...	1.0	39	1

Discovered with the 6-inch. Relative change is not entirely certain, but it is a physical system, as the components have a common proper motion. The principal star has an annual movement of 0".126 in the direction of 219° 0 (AUWERS). If the small star was fixed in space, the position-angle should increase 12° and the distance 2 $\frac{1}{2}$ ' in the interval covered by the measures.

[β (IV)... β (*Mon. Not. XXXIV*, 382)...Cin⁴...Cin⁵...Cin⁶...
 ...*Proc. Haverford Coll. Obs.* (1892)...]
 ...Doolittle (*Pub. Flower Obs.* 1)...]

β 1114. B.A.C. 5090

R.A. 15^h 41^m 38^s 1
 Decl. - 28° 27' 1"

A and B

1889.38	325.7	0.65	7.0...	7.3	39	β
1897.41	323.1	0.81	7...	7.1	39	A
1897.45	319.2	0.66	6.9...	8	19	See

AB and C (= H 4774)

1834.30	8.5	10	7...	1.0	19	II'
1877.41	7.5	8.98	7.0...	10.0	19	Cin
1880.39	6.5	9.17	6.8...	10.0	19	Cin
1889.38	5.8	9.24	7.0...	9.8	39	β
1890.43	2.3	9.71	7.2...	10.0	19	GI
1897.39	5.4	8.90	...	...	29	A
1897.48	4.2	9.25	...	10.5	19	See

The close pair was discovered with the 36-inch. So far there is no sensible change.

The above are all the measures of the Herschel companion, which seems to be fixed. The magnitude of A in GOULD is 6.8.

[β (XVI)... β (2056)... β (*Pub. L. O. II*)...Aitken (3465)...See (3496)...Cin⁴...Cin⁶...Glasenapp (1)...]

β 33, 34. Lalande 28246

R.A. 15^h 24^m 43^s $\frac{1}{2}$
Decl. - 12° 35' $\frac{1}{2}$

A and B ($= \beta$ 33)

1875.36	47.5	2.75	8.0...10.3	3 ⁿ	J
1878.49	43.0	2.94	8.0...10.0	2 ⁿ	Cin
1886.41	41.0	3.14	8.2...10.5	1 ⁿ	LM
1892.40	42.1	3.08	7.8...10.4	2 ⁿ	Lv
1898.04	41.4	2.74	8...10	5 ⁿ	D
1898.44	41.8	2.95	8.0...10.0	3 ⁿ	A

C and D ($= \beta$ 34)

1872.43	55 \pm	3 \pm	10...10		β
1898.04	55.2	6.54	...	5 ⁿ	D
1898.44	56.2	6.58	10.8...10.8	3 ⁿ	A

A and C

1898.45	138.7	246.5	...	1 ⁿ	A
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A and E

1898.27	132.2	31.52	...12.3	4 ⁿ	D
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Discovered with the 6-inch.

[β (1)... β (*Mon. Not. xxxiii*, 351)... β (1)...Cin⁵...LM...
Lv (*A. J.* 278) (*Proc. Haverford Coll. Obs.* 1892)...Aitken
(...)*Doolittle* (*Pub. Flower Obs.* 1)...]

β 944. Lalande 28326

R.A. 15^h 25^m 34^s $\frac{1}{2}$
Decl. + 48° 8' $\frac{1}{2}$

1879.28	128.5	10.74	6.5...12.5	2 ⁿ	β
1891.26	126.7	10.98	6.7...11.0	3 ⁿ	β
1899.08	126.6	10.53	7.0...11.5	1 ⁿ	β

Discovered with the 18 $\frac{1}{2}$ -inch. Apparently fixed. Magnitude in D.M. 6.7; Lalande 6.

[β (XIII)... β (3114)... β (*Pub. L. O. II*)...]

β 945. Lalande 28358

R.A. 15^h 29^m 6^s $\frac{1}{2}$
Decl. - 57° 51' $\frac{1}{2}$

1879.28	13.1	16.37	6.8...12.7	3 ⁿ	β
1891.42	25.5	15.89	6.3...11.7	2 ⁿ	β
1896.49	30.8	15.68	...	3 ⁿ	A
1896.51	31.8	16.03	6.6...12.0	2 ⁿ	Lv
1898.57	34.3	16.09	6.0...12.0	3 ⁿ	A

Discovered with the 18 $\frac{1}{2}$ -inch. The large star has a considerable proper motion:

Stumpe	-	-	0.304 in 297.4
Krueger	-	-	0.295 in 298.5
Porter	-	-	0.308 in 299.1

With PORTER's proper motion and the position given by the measures of 1879, the small star, at the date of the last measures in 1898, should be 34 $^{\circ}$ 3 : 15 $^{\circ}$ 80. It is evident that this is only an optical pair.

[β (XIII)... β (3114)... β (*Pub. L. O. II*)...Aitken (3395)
...Lv (*A. J.* 407)...Aitken (...)]

β 121. B.A.C. 5163

R.A. 15^h 32^m 20^s $\frac{1}{2}$
Decl. - 27° 15' $\frac{1}{2}$

1877.72	278.3	1.68	7.7...7.9	3 ⁿ	Cin
1888.50	274.0	...	...	1 ⁿ	Lv
1889.47	277.5	1.45	8.2...8.2	3 ⁿ	β
1890.45	101.8	1.65	7.2...7.3	2 ⁿ	Gl
1898.48	275.1	1.66	8.3...8.4	2 ⁿ	D

Discovered with the 6-inch. Unchanged.

[β (III)... β (*Mon. Not. xxxiii*, 53)... β (2987)... β (*Pub. L. O. II*)...Cin³...Cin⁴...Cin⁵...Lv⁴...Glasenapp (1)...
Doolittle (*Pub. Flower Obs.* 1)...]

β 122. Lalande 28495

R.A. 15^h 32^m 59^s $\frac{1}{2}$
Decl. - 19° 23' $\frac{1}{2}$

1868.51	22.5	2.01	...	1 ⁿ	Hd
1875.45	204.0	1.76	7.1...7.3	4 ⁿ	J
1877.39	203.6	1.96	7.6...7.7	2 ⁿ	Cin
1881.03	20.7	1.99	7.0...7.5	2 ⁿ	Sp

β 240. W²XV, 731

R.A. 15 37^m 32.1
Decl. + 4 24.1

A and B

1875.00	135.4	2.35	8.5...10.0	4 ^m	J
1880.46	135.9	2.49	8.5... 9.0	1 ^m	β
1892.70	135.0	2.27	8.4... 9.8	3 ^m	1 ^v
1899.26	134.0	2.33	8.5... 9.3	1 ^m	β

A and C

1880.46	42.1	27.88	... 11.5	1 ^m	β
1892.36	40.2	28.33	... 12.0	2 ^m	Lv
1899.26	39.7	28.73	... 11.8	1 ^m	β

Discovered with the 6-inch. Fixed. By an error in the reduction, the distance in β^3 is printed 31'60.

[β (V)... β (*Mon. Not. XXXV, 316*)... β (2) (1)...1^v (*A. J.* 278)] (*Proc. Haverford Coll. Obs.*, 1892)...]

 β 946. B.A.C. 5248

R.A. 15^h 44^m 44.1
Decl. + 55 45.1

1879.28	152.0	1.31	5.2...10.9	3 ^m	β
1891.28	148.9	1.43	5.7...11.5	3 ^m	β

Discovered with the 18½-inch. A fine unequal pair in *Draco*. In HEIS 5^m; D.M. 6.0.

[β (xiii)... β^3 ... β (3114)... β (*Pub. L. O. II*)...]

 β 415. O. Arg. N. 15675

R.A. 15^h 44^m 50^s 1
Decl. + 05 57.1

A and B

1876.39	336.8	12.72	8.5...11.5	1 ^m	J
1892.42	335.4	12.77	8.2...10.5	2 ^m	Lv, C
1899.08	334.5	12.80	8.2...11.0	2 ^m	β

A and C

1876.39	357.6	30.82	...12.0	1 ^m	J
1892.42	358.3	29.22	...10.0	2 ^m	Lv, C
1899.08	358.7	28.39	...11.7	2 ^m	β

Discovered with the 6-inch. The measures of AC indicate a proper motion of 0".1 in one

of the stars. There appears to be no change in AB.

[β (11)... β (2103)...J (1)...1^v and C (11)...J (278)] (*Proc. Haverford Coll. Obs.*, 1892)...]

 β 621. W²XV, 1135

R.A. 15^h 45^m 55^s 1
Decl. + 44 53.1

1878.48	75.1	0.5	7.5... 8.0	1 ^m	β
1884.61	65.5	0.40	...	4 ^m	H Σ
1891.32	62.2	0.57	8.1... 9.3	3 ^m	β
1898.47	58.8	0.62	8 ... 8	2 ^m	D
1898.53	57.0	0.54	...	1 ^m	Lew
1898.57	57.0	0.63	7.5... 8.5	3 ^m	A

Discovered with the 18½-inch. My single measure in 1877 was noted as somewhat uncertain, and therefore the apparent change in the angle may not be real.

[β (x)... β^3 ... β (3114)... β (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX, 400*)...H Σ ()...Aitken ()...Doolittle (*Pub. Flower Obs.*, 1)...]

 β 36. 2 *Scorpii*

R.A. 15^h 46^m 24^s 1
Decl. - 24 58.1

1877.37	277.6	2.47	6.0... 8.0	1 ^m	Cin
1878.40	279.0	2.58	5.5... 8.0	6 ^m	Cin
1880.38	275.4	2.80	5.0... 7.5	1 ^m	Cin
1884.14	274.7	2.89	5.7... 7.7	4 ^m	W
1888.57	277.1	2.63	5.8... 7.0	1 ^m	Lv
1889.47	270.3	2.84	5.5...10.2	2 ^m	T
1892.38	277.8	2.86	5.8... 7.0	2 ^m	Lv
1894.58	276.6	1.94	6 ... 9.5	2 ^m	Sel
1896.32	270.7	2.83	4.5... 7	3 ^m	Teb
1897.47	274.4	2.93	5.9... 7	1 ^m	See
1898.40	275.5	2.88	5 ... 9	3 ^m	Sc

Discovered with the 6-inch. There has been no sensible relative change, but it is without doubt a physical system, as the components have the same proper motion of 0".049 in the direction of 253.56 (AUWERS).

[β (1)... β (*Mon. Not. xxxiii, 351*)...Cin⁴...Cin⁵...Cin⁶...Wilson (*Cin*)...1^v...1^v...J (278)] (*Proc. Haverford Coll. Obs.*, 1892)...Tarrant (1886)...Sellors (3303)...Tebbutt (*Mon. Not. LVII, 584*)...See (3496)...Scott (*Mon. Not. LX, 427*)...]

position of B would be very apparent in the time covered by the measures. The Herschel companion appears to be fixed with reference to A, and is therefore a member of the system. If C had no proper motion, its angle and distance in the interval between 1823 and 1888 would increase respectively 4".7 and 2'.7. It is evident from the measures that no such change has taken place. The Harvard photometric magnitude of β *Scorpii* is 3.0, and of γ 5.2.

Sp (11)...Hall (1, 11)...Aitken (3465)...]

A few only of the measures of AC are given. The following refer to this companion:

Powell (*Mém. R. A. S.* XXV, XXXII)... Mitchell (Cin^a)
 Sté-Ph. And. 1798... Monod 1798...
Journ. de l'Écl. Supér., 1806...
 and Jacob (*Madras Obsrv.* 2d Series)... Herschel (*Mém. R. A. S.*
 V, XXXVIII)... Beer and Madler (280)... Oudemans (926)
 ...Secchi (*Cat. 1321 Stelle Doppie*) (*Double Star Measures* 1855)
 ...Radcliffe (*Obsrv.* 1856)... Hall (*Wash. Obsrv.*
 1863)... J. (1192)... J. (...). Pritchett (*Pub. Marriage Obsv.* 1)
 ...Engelmann (2786)... Cins^a... Tebbutt (*Nat. 1*, 23)...
 Wilson (Cin^a)... Cruis (*Annals Imp. Obf. Rio de Janeiro*, IV,
 Part 1)... Glaspennet (...). Hussey (*A. F.* 3971...)...

GOULD puts this in *Ophiuchus*, 6.8 m. Lalande

5311...β...Lv...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Herschel (Cape Obsns.)...]

β 811. W. XV. 15.

$$15. \Delta = 22^\circ 30'$$

1881.31	222.0	8.49	8.1...12.1	26	β
1888.56	219.0	8.70	8.5...12.0	35	α
1889.49	220.7	8.70	7.8...10.8	37	β
1890.28	223.5	8.88	8.0...12.0	29	β

Discovered with the 15½-inch at the Washburn Observatory. This star, according to the *Berlin A. G. Catalogue*, has a proper motion of 0".109 in the direction of 297°.3. The components are obviously moving together.

[β (xii)... β^4 ... β (2957)... β (*Pub. L. O.* ii)... Comstock
(*Pub. Washburn Obsy.* vi)...]

β 39. 11. N. 17. 18.

R.A. 16^h 57^m 57^s
Decl. — 1° 22' 30"

1874.55	258.2	3.73	6.0	1.11	1.0	Ks
1875.71	256.5	3.35	6.1	1.10	1.0	J
1876.38	258.9	3.77	6.0	1.10	1.0	Cin
1879.49	258.4	3.33	6.0	1.11	1.0	B
1879.58	256.5	3.33			1.0	Pt
1880.48	256.0	3.29	6.0	1.11	1.0	Cin
1882.38	254.6	3.20			1.0	W
1888.44	250.4	3.33	5.5	1.10	1.0	Lv
1880.44	257.7	3.28	6.0	1.10	1.0	L
1880.48	258.3	3.33	6.0	1.11	1.0	B

Discovered with the 6-inch. The measures do not show any relative motion, and the proper motion of the principal star of $\sigma^{\circ}080$ in the direction of 245.8 (AUWERS) belongs to the small star as well. It will be shown hereafter to be a physical system, but of long period. There is a 13m star,

(*Mem. R. A. S.* XLIII)...Cin⁵...Cin⁶...Pritchett (*Pub. Morrison Ohgy.* 1)...Wilson (Cin¹⁰)...Lv¹...Tarrant

β 948. *Linnæus* 213

R. A. 15 54 2 0
 Dec. 11 2 58 0

A. 42:1 B.

1879.59	150.5	1.46	6.8..	47	5
1888.16	117.1	1.55	6.0	47	15

1802.40 140.3 1.54 7.1... 9.4 1.3

$$A \text{ and } C \in \Sigma_{\mathbb{R}} \Rightarrow z \in \mathbb{R}.$$

1835.6	232.5	20	7	12	18	11
1870.12	222.7	28.54		10.1	11	3

1892.41 234.8 2.7 3 10.4 2.7 1.9

1855.6	185.2	35±	1.12	11
1870.12	102.7	22±	10.8	3

1892.41 194.9 22.72 110.8 400 Lv

The duplicity of the principal star of Σ 2005 *rej.* was discovered with the 18 $\frac{1}{2}$ -inch. All the measures of the distant stars are given above.

1876.53	301.5	0.7	1	6.5	5u	Sp
1877.49	364.4	0.64	1	6.0	5u	Cin
1878.35	363.7	1.04	1	6.0	5u	β
1878.36	356.4	0.52	1	6.0	5u	Ru
1879.53	360.2	0.74	1	6.0	5u	Cin
1879.58	362.0	0.65	1	5.0	5u	Sp
1879.59	305.3	0.74	1	7	5u	Hl
1880.00	366.2	0.66	1	5.7	5u	β
1880.40	361.0	0.66	1	5.7	5u	Cin
1880.54	360.9	0.53	1	5.7	5u	Pt
1881.45	366.7	0.81	1	5.7	5u	β
1882.55	356.9	0.72	1	5.7	5u	Sp
1884.40	303.4	0.72	1	7.5	5u	W
1886.30	307.2	0.65	1	6	5u	L M
1886.42	357.3	0.65	1	6	5u	Sm
1886.52	309.3	1.28	1	7.0	5u	L
1886.61	303.9	0.74	1	5.7	5u	Hl
1888.36	362.8	0.93	1	5.7	5u	F
1888.41	364.1	0.80	1	5.7	5u	Lx
1888.57	364.9	0.50	1	5.7	5u	Hl
1889.44	361.2	0.80	1	5.7	5u	β
1895.48	362.8	0.81	1	5.7	5u	A
1896.51	303.5	1.15	1	5.7	5u	Hl
1896.59	367.4	0.88	1	5.7	5u	Pt
1897.48	360.6	0.71	1	5.7	5u	A

C and D (M. 10000)

1846.58	30.0	1.11	7.0	8.0	2u	Mh
1868.51	41.3	2.03	7.0	8.0	1u	Hd
1875.42	47.9	1.89	7.0	8.0	1u	J
1877.78	45.6	2.08	7.0	8.0	8u	Sp
1879.41	45.2	2.07	7.1	8.0	9u	Cin
1881.31	46.6	2.02	7.1	8.0	4u	β
1886.51	49.5	2.10	7.3	8.0	4u	T
1886.61	45.8	2.05	7.1	8.0	3u	Hl
1888.42	48.3	2.22	7.4	8.1	3u	Lv
1897.48	48.7	2.02	7.1	8.0	3u	Sc
1897.48	43.6	2.05	7.1	8.0	3u	A
1897.60	45.5	1.78	7.1	8.0	4u	Ru
1898.54	45.0	2.05	7.1	8.0	2u	Maw

AB and C (H. V. 6 - S. 229)

1782.30	334.9	38.33	2u	H'
1821.36	338.2	40.82	1u	St
1875.43	339.8	40.77	1u	J
1879.58	337.7	40.98	3u	Sp
1881.60	336.6	40.07	2u	β
1886.61	336.8	40.03	3u	Hl
1897.60	326.4	41.12	1u	Ru

The close pair was discovered with the 6-inch. The duplicity of Herschel's companion was discovered by MITCHELL at Cincinnati in 1846, and independently by JACOB the following year. The measures of AB show no sensible motion, and the same may be said of CD. There has been no change in the distance or direction of the two pairs with reference to each other. The principal star, according to AUWERS, has a proper motion of 0.042 in the direction of 251°9. The four components are evidently moving together, and undoubtedly form one vast quadruple system. This is in the midst of a complex nebulous area discovered by BARNARD (see *Mon. Not.* LIX, 367).

[3 *Mon. Not. Astr. Soc.* 1890, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.]

The following relate to observations of the old components:

[Herschel (*Cape Obs.*)... Wrottesley (*Mem. R. A. S.* XXIX) ... Worster and Jacob (*Madras Obs.*, First Series)... Secchi (*Catalogo di 1321 Stelle Doppie*, app.) (*Mem. Coll. Rom.* 1855) ... *Annals Harvar Obs.* XIII... Mitchell (*Cin*)... Glasenapp (*Mon. Not. Astr. Soc.* 1890, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.]

β 624. O. Arg. S. 15565

R.A. 10^h 15^m 42^s
Decl. = 22° 50' N

1878.47	321.7	1.12	8.0	9.7	2u	β
1879.39	320.0	1.25	7.7	9.8	3u	Cin
1880.38	320.9	1.25	7.7	9.8	1u	Cin
1891.51	322.2	1.17	8.1	10.2	0u	β
1895.63	316.1	1.15	8.1	10.6	3u	A

Discovered with the 6-inch. Near 5 *Ophiuchi*.

[β (x)...β...β (3114)...β (*Pub. L. O. II*)...Cin⁵...Cin⁶.

Auwers (*Mon. Not. Astr. Soc.* 1890, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479,

Discovered with the 36-inch. AUWERS gives the proper motion of τ *Herculis* 0.035 in the direction of 330.5. It is uncertain from the measures whether or not the companion shares this movement. From the position of 1890, and this proper motion, the small star in 1898, if fixed in space, should be 145.5 : 6.8. The probabilities are that this is not a physical system. The magnitude of the companion, and its distance from the primary during the whole of the present century, will explain its non-discovery heretofore.

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

β 41. δ 22° 00' 15" N

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

Discovered with the 6-inch. Probably fixed. Σ 2045 is *sp* in a low-power field.

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

β 1115. ω *Herculis*

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

Discovered with the 36-inch. This is in the field with ϵ *Ophiuchi* (δ Sh 228), and was measured from that star by JACOB at Madras. These

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

The proper motion of Lalande 29840 is given by PORTER as 0.064 in the direction of 225.3. The components are therefore moving together in space, and doubtless form a binary system. The last *Radcliffe Catalogue* gives the proper motion of ϵ *Ophiuchi* 0.046 in the direction of 258.7.

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

β 050. δ 10° 10' 30" N

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

Discovered with the 18½-inch.

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

β 051. ω *Herculis*

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

Discovered with the 18½-inch. Near ν *Coronae*.

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

β 625. ω *Herculis*

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

1890.000 : 3 00000000 : 3 1780 : 3 0000 : 10000

1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000
1890.000	1890.000	1890.000	1890.000	1890.000	1890.000

Discovered with the 18½-inch. AUWERS (A.N. 3509) gives the corrected proper motion of this star $\sigma^{\circ}065$ in the direction of $159^{\circ}1$. The measures of C in 1890 and 1898 give for the movement of A, assuming the small star to be fixed, $\sigma^{\circ}079$ in $149^{\circ}0$. It is probable, therefore, that this star has no sensible motion of its own, and that AB form a physical system.

$$[3 \quad \dots \quad 3^2 \quad \dots \quad 3^3 \quad \dots \quad 3 \quad 3048 \dots \quad 3 \quad 376 \quad 6 \quad 6 \quad 40] \quad \text{Aitken}$$

β 813. W. XVI. 2011

R.A. 16 25 2 6
Dec. — 26 28 3

1881.30	165.4	0.96	8.4	8.4	34	3
1888.61	165.4	1.00	8.5	8.6	35	Cont.

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)... β^4 ...Comstock (*Pub. Washburn Obsy.*, VI)...]

β 814. W. XVI. 1-2

R.A.	15	237	2	0
Decl.	+	4	2	0

1881.38	322.6	0.36	8.4...	8.7	30	B
1891.32	324.1	0.31	8.4...	8.4	30	B
1893.57	318.9	0.25			16	Com
1895.02	328.4	0.25			34	Com
1896.43	331.9	0.25			26	Com
1898.47	325.9	0.29	8+...	8+	20	D
1898.53	325.2	0.28			100	Lw
1898.67	326.4	0.35	8.5...	8.5	35	A

Discovered with the 15½-inch at the Washburn Observatory. The measures show no sensible change.

(*Pub. Washburn Obsy.* x)...Doolittle (*Pub. Flower Obsy.* 1)...Lewis (*Mon. Not.* LIX, 400)...Aitken ()...]

β 815. W XVI.

Re-A	100	2.5	100	0
Lo	100	2.5	100	0

1881.30	348.4	6.42	8.1...104	30	B
1886.40	344.5	7.28	8.2...103	79	1 B
1888.95	343.2	7.42	8.1...103	48	100%
1880.43	343.3	7.68	8.5...108	39	B

1890.33	344.4	7.70	8.4...	9.7	3M	β
1892.17	344.5	7.67	8.4...	10.2	3M	β
1896.47	344.6	8.65	8.1...	10.3	3M	1.v
1896.59	337.8	8.73	8.5...	10.2	2M	Soul-
1897.70	340.1	9.09	...	...	3M	1
1898.61	340.6	8.89	8.5...	10.5	3M	A

Discovered with the 15½-inch at the Washburn Observatory. The change shown by the measures is certainly due to proper motion of one star or the other. PORTER finds no evidence of this in the meridian observations of A. The companion has an apparent annual motion of 0".155 in the direction of 141°.6. This is unusual in so small a star. The measured positions are shown in the following diagram:

(2786)...Comstock (*Pub. Washburn Oby.* vi) (*Sid. Mess.* ix, 78)...Lv (*A. J.* 407)...Sould (*A. J.* 410)...Doolittle (*Pub. Flower Oby.* i)...Aitken ()...

β 626. φ (1) *Chrysomelidae*

KA	15	24	10	0
Doubt	0	10	20	0

1878.41	35.9	32.46	4	12.5	2%	♂
1892.40	35.8	33.4		12.5	2%	♂
1898.30	35.3	33.3		12.5	2%	♂
1898.41	35.7	33.38		12.5	1%	♀

General Catalogue of Double Stars

Discovered with the 15 $\frac{1}{2}$ -inch with the 186 $\frac{1}{2}$ -inch. The principal star has a proper motion of $\epsilon 29.8$ in the direction of 249.1 (AUWERS). This accounts for the change in the companion. The proper motion and the position of 1878 give for B

[β (811) ... β^A ... β (2030) ... β (Pub. L. O. II) ... H Σ () ...

β 816. $\epsilon 31$ Hercules

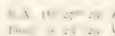


1860.00	223.6	5.65	6.3 ... 11.8	3 u	β
1884.89	223.6	5.65		10	H Σ
1888.54	221.2	5.18	7.5 ... 11.8	18	Com
1890.00	220.2	5.18	5.9 ... 11.8	3 u	β
1898.47	220.2	5.11	6.0 ... 9.5	20	D

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. AUWERS gives this star a proper motion of $\epsilon 0.42$ in the direction of 260.3 . With this movement, and the position of 1881, the companion, if fixed, should be at the date of the last measures, $218.6:4.41$. It is therefore probable that it is moving with the primary.

[β (800) ... β (812) ... β (816) ... β (822) ...
... Comstock (Pub. Washburn Obs. VI) ... Doolittle (Pub. Flower Obs. I) ...]

β 817. W ϵ NV1, 795



1880.00	147.6	1.14	8.2	8.2	4 u	β
1898.48	147.6	1.14	8.6	8.7	3 u	Com

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. Unchanged.

[β (811) ... β^A ... Comstock (Pub. Washburn Obs. VI) ...]

β 818. $\epsilon 32$ Hercules

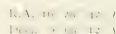


1881.48	33.5	3.29	6.3 ... 13.5	3 u	β
1888.25	36.1	3.42	6.5 ... 13.5	3 u	Com
1898.64	33.8	3.96	6.3 ... 13.8	3 u	A

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. AUWERS gives the proper motion of 32 *Herculis*, $\epsilon 0.67$ in the direction of 243.7 . This does not fully explain the change in the distance of the companion. That change would indicate a proper motion of about $\epsilon 0.04$ in 213.7 .

[β (811) ... β^A ... β (2030) ... β (Pub. L. O. II) ... H Σ () ...
Comstock (Pub. Washburn Obs. VI) ... Aitken () ...]

β 356. O ϵ A15, N, 10330

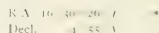


1876.21	118.8	6.85	9.2	11.5	3 u	J
1892.34	118.9	7.17	8.6	11.5	3 u	β
1897.71	119.2	6.85	8.56	11	3 u	D

Discovered with the 6-inch. Without change.

[β (811) ... β (2030) ... β (Pub. L. O. II) ... J (1) ... Doolittle (Pub. Flower Obs. I) ...]

β 819. S.D. 11, 1133

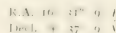


1881.44	236.8	1.59	8.6	11.3	3u	β
1888.60	231.3	1.59	8.7 ... 11.5	3u	Com	

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory.

[β (811) ... β^A ... Comstock (Pub. Washburn Obs. VI) ...]

β 952. W ϵ NV1, 938



A and B

1880.48	146.1	3.85	8.0 ... 10.3	3 u	β
1892.24	149.1	3.96	8.1 ... 9.3	3 u	β
1898.67	144.8	3.78	8.0 ... 9.0	2 u	A

B and C

1892.24	244.3	2.13	13.7	3 u	β
1898.67	233.5	2.48	14.6	2 u	A

B was discovered with the 18½-inch, and in measuring that with the 36-inch the third star was added.

[β^1 (X11) ..., β^3 ..., β^4 (X12) ..., β^5 (X13) ..., β^6 (X14) ..., β^7 (X15) ..., β^8 (X16) ..., β^9 (X17) ..., β^{10} (X18) ..., β^{11} (X19) ..., β^{12} (X20) ..., β^{13} (X21) ..., β^{14} (X22) ..., β^{15} (X23) ..., β^{16} (X24) ..., β^{17} (X25) ..., β^{18} (X26) ..., β^{19} (X27) ..., β^{20} (X28) ..., β^{21} (X29) ..., β^{22} (X30) ..., β^{23} (X31) ..., β^{24} (X32) ..., β^{25} (X33) ..., β^{26} (X34) ..., β^{27} (X35) ..., β^{28} (X36) ..., β^{29} (X37) ..., β^{30} (X38) ..., β^{31} (X39) ..., β^{32} (X40) ..., β^{33} (X41) ..., β^{34} (X42) ..., β^{35} (X43) ..., β^{36} (X44) ..., β^{37} (X45) ..., β^{38} (X46) ..., β^{39} (X47) ..., β^{40} (X48) ..., β^{41} (X49) ..., β^{42} (X50) ..., β^{43} (X51) ..., β^{44} (X52) ..., β^{45} (X53) ..., β^{46} (X54) ..., β^{47} (X55) ..., β^{48} (X56) ..., β^{49} (X57) ..., β^{50} (X58) ..., β^{51} (X59) ..., β^{52} (X60) ..., β^{53} (X61) ..., β^{54} (X62) ..., β^{55} (X63) ..., β^{56} (X64) ..., β^{57} (X65) ..., β^{58} (X66) ..., β^{59} (X67) ..., β^{60} (X68) ..., β^{61} (X69) ..., β^{62} (X70) ..., β^{63} (X71) ..., β^{64} (X72) ..., β^{65} (X73) ..., β^{66} (X74) ..., β^{67} (X75) ..., β^{68} (X76) ..., β^{69} (X77) ..., β^{70} (X78) ..., β^{71} (X79) ..., β^{72} (X80) ..., β^{73} (X81) ..., β^{74} (X82) ..., β^{75} (X83) ..., β^{76} (X84) ..., β^{77} (X85) ..., β^{78} (X86) ..., β^{79} (X87) ..., β^{80} (X88) ..., β^{81} (X89) ..., β^{82} (X90) ..., β^{83} (X91) ..., β^{84} (X92) ..., β^{85} (X93) ..., β^{86} (X94) ..., β^{87} (X95) ..., β^{88} (X96) ..., β^{89} (X97) ..., β^{90} (X98) ..., β^{91} (X99) ..., β^{92} (X100) ..., β^{93} (X101) ..., β^{94} (X102) ..., β^{95} (X103) ..., β^{96} (X104) ..., β^{97} (X105) ..., β^{98} (X106) ..., β^{99} (X107) ..., β^{100} (X108) ..., β^{101} (X109) ..., β^{102} (X110) ..., β^{103} (X111) ..., β^{104} (X112) ..., β^{105} (X113) ..., β^{106} (X114) ..., β^{107} (X115) ..., β^{108} (X116) ..., β^{109} (X117) ..., β^{110} (X118) ..., β^{111} (X119) ..., β^{112} (X120) ..., β^{113} (X121) ..., β^{114} (X122) ..., β^{115} (X123) ..., β^{116} (X124) ..., β^{117} (X125) ..., β^{118} (X126) ..., β^{119} (X127) ..., β^{120} (X128) ..., β^{121} (X129) ..., β^{122} (X130) ..., β^{123} (X131) ..., β^{124} (X132) ..., β^{125} (X133) ..., β^{126} (X134) ..., β^{127} (X135) ..., β^{128} (X136) ..., β^{129} (X137) ..., β^{130} (X138) ..., β^{131} (X139) ..., β^{132} (X140) ..., β^{133} (X141) ..., β^{134} (X142) ..., β^{135} (X143) ..., β^{136} (X144) ..., β^{137} (X145) ..., β^{138} (X146) ..., β^{139} (X147) ..., β^{140} (X148) ..., β^{141} (X149) ..., β^{142} (X150) ..., β^{143} (X151) ..., β^{144} (X152) ..., β^{145} (X153) ..., β^{146} (X154) ..., β^{147} (X155) ..., β^{148} (X156) ..., β^{149} (X157) ..., β^{150} (X158) ..., β^{151} (X159) ..., β^{152} (X160) ..., β^{153} (X161) ..., β^{154} (X162) ..., β^{155} (X163) ..., β^{156} (X164) ..., β^{157} (X165) ..., β^{158} (X166) ..., β^{159} (X167) ..., β^{160} (X168) ..., β^{161} (X169) ..., β^{162} (X170) ..., β^{163} (X171) ..., β^{164} (X172) ..., β^{165} (X173) ..., β^{166} (X174) ..., β^{167} (X175) ..., β^{168} (X176) ..., β^{169} (X177) ..., β^{170} (X178) ..., β^{171} (X179) ..., β^{172} (X180) ..., β^{173} (X181) ..., β^{174} (X182) ..., β^{175} (X183) ..., β^{176} (X184) ..., β^{177} (X185) ..., β^{178} (X186) ..., β^{179} (X187) ..., β^{180} (X188) ..., β^{181} (X189) ..., β^{182} (X190) ..., β^{183} (X191) ..., β^{184} (X192) ..., β^{185} (X193) ..., β^{186} (X194) ..., β^{187} (X195) ..., β^{188} (X196) ..., β^{189} (X197) ..., β^{190} (X198) ..., β^{191} (X199) ..., β^{192} (X200) ..., β^{193} (X201) ..., β^{194} (X202) ..., β^{195} (X203) ..., β^{196} (X204) ..., β^{197} (X205) ..., β^{198} (X206) ..., β^{199} (X207) ..., β^{200} (X208) ..., β^{201} (X209) ..., β^{202} (X210) ..., β^{203} (X211) ..., β^{204} (X212) ..., β^{205} (X213) ..., β^{206} (X214) ..., β^{207} (X215) ..., β^{208} (X216) ..., β^{209} (X217) ..., β^{210} (X218) ..., β^{211} (X219) ..., β^{212} (X220) ..., β^{213} (X221) ..., β^{214} (X222) ..., β^{215} (X223) ..., β^{216} (X224) ..., β^{217} (X225) ..., β^{218} (X226) ..., β^{219} (X227) ..., β^{220} (X228) ..., β^{221} (X229) ..., β^{222} (X230) ..., β^{223} (X231) ..., β^{224} (X232) ..., β^{225} (X233) ..., β^{226} (X234) ..., β^{227} (X235) ..., β^{228} (X236) ..., β^{229} (X237) ..., β^{230} (X238) ..., β^{231} (X239) ..., β^{232} (X240) ..., β^{233} (X241) ..., β^{234} (X242) ..., β^{235} (X243) ..., β^{236} (X244) ..., β^{237} (X245) ..., β^{238} (X246) ..., β^{239} (X247) ..., β^{240}

β 820. *Laurels* 31279

R.A. 10 33 8
Decl. 2 52

1881.35	237.6	4.24	8.0...	0.5	39	β
1888.50	233.1	4.30	7.8...	0.5	39	Com
1892.38	237.4	4.28	7.8...	10.4	39	β

Discovered with the 15½-inch at the Washburn Observatory. The *Raddcliffe Catalogue* for 1890 gives the proper motion of this star 0.112 in the direction of 290°.9. The measures show no relative change, and therefore this movement belongs to both stars.

[β (N10)... β^1 ... β (3142)... β (Pub. I. O. II)...Comstock
(Pub. Washburn Obsy. VI)...]

β 42. W. XVI. 1076

R.A. 16^h 35^m 20^s \pm 1
Decl. $+29^{\circ} 15'$ \pm 1

1873.47	39.3	7.50	8.5...	9.0	1M	OS
1874.40	39.4	6.80	9	10	1M	WS
1875.10	41.9	7.23	10.0...	10.5	3M	J
1892.33	41.9	7.28	8.8...	9.1	2M	β
1898.51	40.2	7.45	9.7	9.9	2M	Gl

Discovered with the 6-inch. Probably fixed.

[β (1)... β (*Mon. Not.* XXXIII, 351)... β (3142)... β (*Pach. I.*
O. II)...Wilson and Seabroke (*Mem. R. A. S.* XLIII)...
O Σ (*Poulkova Obsns.* XI)...J (1)...Glasenapp (X)...]

β 1116. B.A.C. 2600

R.A.	16	36	51	l
Decl.	27	14	8	8

1889.39	359.4	1.78	0.7	11.7	39	β
1897.46	355.3	1.85	0.8	12	39	A
1897.48	356.7	2.21	0.5	11.2	19	See

Discovered with the 12-in. In. *Scopoli*: Gould
6.8 m. See measures at 14 m stat. 107: 25.42
(1897.48) 1 n.

[31] J. L. Loebl, *J. Combin. Theory Ser. B* **32** (1982), no. 1, 1–12.

β 953. 01. Aug. N. 10451

R.A. 16^h 37 21
Decl. +7 2 8

1879.27	328.7	0.30	7.8...	7.5	1.0	β
1891.42	302.8	0.12	7.8...	8.5	1.0	β
1892.39	298.1	0.18	8.0...	7.5	2.0	β
1898.27	265.9	0.32	8.0...	9.0	1.0	β

Discovered with the 18½-inch. It was a very difficult pair with that aperture at the time of discovery, and is still more difficult since. It is a binary in rapid motion. The distance in the last measure (1898) is certainly too large. This is the *sp* of two 8 m stars; the other is 22^s f and 1' 40" m.

[β (XIII) = β^1 = β (3114, 3142) = β (I) = I, c. 2000,]

β 1199. (Messer 131)

R.A. 10^h 37^m 23^s \pm 1^s
Decl. +30° 41' 5" \pm 5"

B and C

1890.45	239.4	0.88	11.4 . . . 12.0	3n	β
1898.54	240.4	0.97	. . .	2n	Bar

A and B

1890.45	310.3	2.61	10.8...	3 <i>n</i>	β
1898.54	308.1	2.76	...	4 <i>n</i>	Bar

One of the principal stars, and near the center, of the great cluster in *Hercules* (Messier 13); discovered with the 36-inch. The close pair is No. 320 of *Scheiner's Catalogue* of the stars in M 13.

[S. NATHAN, *B* 30471, *B* *Pu*, *I*, 0 10] Barnard (1971)

β 43. W° XVI. -88

R.A. 10^h 42^m 19^s *h*
Decl. + 2° 57' *h*

1874.43	71.0	0.95	8	...	9	19	WS
1875.22	246.5	0.80	8.7	...	8.8	49	J
1878.54	244.0	0.98	8.5	...	9.0	29	Sp
1892.38	245.0	1.01	8.2	...	8.8	28	β
1898.64	242.8	1.15				19	B

Discovered with the 6-inch. Fixed.

[8] (i) ... [8] *Mon. Not. Astr. Soc.*, 181, 3 (1142) ... [9] *Phil. Mag.*, 1 (1842) ... [10] *Wilson and Sealroke*, *Mon. J.*, 4, 5 (1110) ... [11] ... Sp (11) ... Brown () ...]

β 627. 32 Hercules

R.A. 16^h 23^m 1^s
Decl. 24° 22' N

1877.49	306.4	3.8	5.0...10.5	3 ^m	β
1878.88	306.6	3.8	5.0...10.5	1 ^m	β
1879.00	306.2	3.8	5.0...10.5	3 ^m	H Σ
1881.47	306.2	3.8	5.1...9.5	8 ^m	L Σ
1881.88	318.7	3.8	5.0...9.1	3 ^m	β
1884.38	314.5	3.8	5.0...9.5	3 ^m	L Σ
1887.50	314.5	3.8	5.0...9.3	3 ^m	A

Discovered with the 18 $\frac{1}{2}$ -inch. The principal star has a proper motion of 0".073 in the direction of 210.7 (AUWERS). The measures indicate that this is common to both components, as otherwise there would be a much larger increase in the angle, with a distance of about 2".5 at the date of the last measures. BIGOURDAN measures two 12 m stars 228°.6 : 67°.01, and 267°.6 : 143°.15 (1881.42) 1^m.

1877.49...Aitken ()...H Σ ()...]
1878.88...Aitken ()...H Σ ()...]
1879.00...Aitken ()...H Σ ()...]
1881.47...Aitken ()...H Σ ()...]
1881.88...Aitken ()...H Σ ()...]
1884.38...Aitken ()...H Σ ()...]
1887.50...Aitken ()...H Σ ()...]

 β 821. 101 Hercules

R.A. 16^h 41^m 3^s
Decl. 26° 57' N

1877.49	313.6	3.8	5.0...10.5	3 ^m	β
1878.88	313.6	3.8	5.0...10.5	3 ^m	Cin Σ

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory.

1877.49...Aitken ()...H Σ ()...]
1878.88...Aitken ()...H Σ ()...]
1879.00...Aitken ()...H Σ ()...]
1881.47...Aitken ()...H Σ ()...]
1881.88...Aitken ()...H Σ ()...]
1884.38...Aitken ()...H Σ ()...]
1887.50...Aitken ()...H Σ ()...]

 β 123. 101 Andromeda

R.A. 16^h 41^m 3^s
Decl. 26° 57' N

1877.49	203.5	1.67	8.5...8.8	2 ^m	Cin
1878.88	205.1	1.56	8.5...8.5	3 ^m	W
1879.00	203.6	1.67	8.5...8.8	3 ^m	L Σ

Discovered with the 10-inch at the Washburn Observatory. Fixed in S.D. 80 m.

1877.49...Aitken ()...H Σ ()...]
1878.88...Aitken ()...H Σ ()...]
1879.00...Aitken ()...H Σ ()...]
1881.47...Aitken ()...H Σ ()...]
1881.88...Aitken ()...H Σ ()...]
1884.38...Aitken ()...H Σ ()...]
1887.50...Aitken ()...H Σ ()...]

 β 241. Ophiuchi 74

R.A. 16^h 23^m 1^s
Decl. 24° 22' N

1877.49	337.0	0.57	7.0...7.1	2 ^m	Cin
1878.88	345.1	0.62	7.0...7.0	2 ^m	Sp
1879.00	345.0	0.63	7.0...7.2	2 ^m	Cin
1881.47	343.0	0.70	7.0...7.0	1 ^m	β
1881.88	343.0	0.65	6.7...6.8	3 ^m	β
1884.38	343.0	0.5 \pm	7.0...7.0	1 ^m	W
1887.50	305.3	0.42	7.0...7.0	1 ^m	Ho
1888.50	304.2	0.40	7.2...7.2	2 ^m	Lv
1890.40	300.0	0.75	7.2...7.2	3 ^m	β
1891.03	302.1	0.71	7.0...7.2	3 ^m	A

Discovered with the 6-inch. Change is uncertain. Lalande 30725. In GOULD 6.8 m.

[β (V)... β (Mon. Not. XXXV, 31)... β ... β (3048)... β (Pub. L. O. II)... β (H)...Cin Σ ...Cin Σ ...Wilson (Cin Σ)...Hough (2078)...L Σ ...Aitken (Ast. Soc. Pac. VII, 305)...]

 β 1117. 24 Ophiuchi

R.A. 16^h 23^m 1^s
Decl. 24° 22' N

1877.49	294.2	0.70	6.4...6.5	4 ^m	β
1880.63	235.7	0.58	6.4...6.5	1 ^m	Ho
1890.45	264.3	0.58	6.4...6.5	3 ^m	β
1891.03	269.0	0.76	6.0...6.2	2 ^m	W
1893.50	270.6	0.50	6.1...6.4	2 ^m	L Σ
1897.47	267.2	0.62	6.4...6.4	3 ^m	A

Discovered with the 12 inch. It had been previously seen by H. COHEN, and appears as Ho 265 of his list of new pairs subsequently published. There is no material change in either angle or distance. This star has a proper motion of 0".027 in the direction of 265.9 (AUWERS), and this is the movement of both stars; otherwise, it would have been discovered long before.

[β (XVI)... β (2056, 3048)... β (Pub. L. O. II)...Hough (2077)...Wilson ()...L Σ (A. J. 382)...Aitken (3405)...]

 β 054. 54 Hercules

R.A. 16^h 50^m 0^s
Decl. 28° 18' N

1879.36	175.4	2.56	5.0...5.2	3 ^m	β
1882.16	14.2	3.62	5.0...5.0	1 ^m	O Σ
1887.17	178.1	2.81	5.0...5.0	3 ^m	H Σ
1891.27	174.0	2.56	5.0...5.2	3 ^m	β
1898.47	175.8	2.73	5.0...5.0	2 ^m	L Σ

Discovered with the 18½-inch. There is no relative change, but it must be a physical system, as the components have a common proper motion of 0".119 in the direction of 282°.1 (AUWERS). If the small star was fixed, the change in the position angle to 1891 would be about 25°. The measure by OΣ is noted "very uncertain."

[3 (XII)...β...β (3111)...β (Pul. I. O. 11)...OΣ (Poulkova Obsn. X)...Doodlie (Pul. Fibra Obsn. 1)...HΣ ()....]

β 955. Redhill 2542

R.A. 16^h 55^m 50^s *t*
Decl. +82° 43' *t*

1880.68	348.0	0.54	8.2...	0.5	3 ^m	β
1891.32	352.0	0.64	8.1...	0.3	3 ^m	β
1898.63	351.0	0.76	8.2...	0.5	3 ^m	Λ

Discovered with the 18½-inch. It is 7.11 s of α *Ursae Minoris* and 2^m 27^s p.

[3 (XIII)...β...β (3111)...β (Pul. I. O. 11)...Aitken ()....]

β 822. Hericulis 168

R.A. 16^h 38^m 40^s *t*
Decl. +19° 51' *t*

1881.50	228.0	1.50	6.9...	11.3	3 ^m	β
1885.50	215.2	1.72			2 ^m	HΣ
1888.50	230.0	1.81	7.0...	10.0	3 ^m	Com
1896.52	228.1	1.64	6.8...	11.2	3 ^m	Lv

Discovered with the 15½-inch at the Washburn Observatory. The *Berlin A. G. Catalogue* gives this star a proper motion of 0".036 in the direction of 291°.0, and the measures show that this is the movement of the small star.

[3 (XIII)...β...Comstock (Pul. Washburn Obsn. 1)...Lx (A. J. 407)...HΣ ()....]

β 357. Lalande 3164

R.A. 16^h 52^m 52^s *t*
Decl. +19° 28' *t*

1875.56	294.7	1.15	8...	10...	3 ^m	Λ
1876.50	298.0	1.14	7.8...	9.0	0 ^m	OΣ
1882.54	310.0	1.00	7.8...	10...	0 ^m	OΣ

1885.52	295.5	1.56			2 ^m	HΣ
1891.49	302.5	1.08	8.4...	9.4	3 ^m	β
1895.50	302.5	1.31	8.2...	9.4	3 ^m	Λ
1896.51	298.0	1.20	8.0...	9.3	3 ^m	Lv
1896.53	300.0	0.99			2 ^m	Lw

Discovered with the 6-inch. Change uncertain.

[3 (VI)...β (2602,3114)...β (Pul. I. O. 10)...Λ ()...OΣ (Poulkova Obsn. X)...HΣ ()...Aitken (Astr. Soc. Pac. VII, 305)...Lv (A. J. 407)...Lewis (Mon. Not. LIX, 400)....]

β 823. Lalande 3167

R.A. 17^h 0^m 27^s *t*
Decl. +0° 49' *t*

1881.39	353.9	1.04	8.2...	9.2	1 ^m	β
1888.41	357.1	1.19	8.5...	9.5	3 ^m	Com
1888.52	358.2		8.0...	9.3	1 ^m	Lv
1889.48	359.8	1.17	8.7...	9.5	3 ^m	β
1893.43	361.4	1.15	8.8...	10.2	3 ^m	W
1895.67	366.4	0.85	8.3...	9.4	3 ^m	A
1895.71	363.3	0.97			5 ^m	Sp
1896.49	365.3	0.95	8.0...	9.2	3 ^m	Lv

Discovered with the 15½-inch at the Washburn Observatory. Direct angular motion is clearly established by the measures.

[3 (XIII)...β...β (2652)...β (Pul. I. O. 11)...Comstock (Pul. Washburn Obsn. VI)...Lx (A. J. 407)...Lx (A. J. 407)...Washburn (A. J. 407)...Aitken (A. J. 407)...Lx (A. J. 407)...HΣ ()....]

β 1088. μ Draconis

R.A. 17^h 2^m 51^s *t*
Decl. +52° 28' *t*

B and C

1889.27	190.0	1.248			3 ^m	β
1891.30	189.7	1.220			3 ^m	β
1892.30	191.3	1.211			3 ^m	β
1893.28	190.8	1.236			3 ^m	β
1898.62	190.0	1.243			3 ^m	Λ
1899.44	190.2	1.243			3 ^m	β

A and B (Σ 2433)...H (11.13)...Sp (242)

1890.79	200.8	1.27	8.3...	8.1	1 ^m	Σ
1894.26	188.3	1.04			1 ^m	Λ

1808.1	1808.2	1811	0.02
1808.1	1808.2	1811	0.4
1808.1	1808.2	1811	0.02
1808.1	1808.2	1811	0.11
1808.1	1808.2	1811	0.10
1808.1	1808.2	1811	0.0
1808.1	1808.2	1811	0.0001
1808.1	1808.2	1811	0.0

The faint star, C, was detected with the 36-inch. The bright stars, A and B, have the same proper motion, according to AUWERS, of $0''.126$ in the direction of 308.2. With this movement of B, and the position of the companion from the measures of 1880, if C was fixed in space, its relation to B at the date of the last measures in 1898 should be 186.2:12.83. It seems practically certain, from the measures taken together, that no such change in C has taken place, and that, therefore, the new star is a member of the physical system.

On the accompanying diagram the measured positions of C from the several places of B in the line of its proper motion are shown:



Diagram illustrating the relative positions of stars A, B, and C, showing the line of proper motion (P.M.) and the line of distance.

As a double star this is known as $\Sigma 2130$ (γ H¹ II. 13 = Sh 242). It was discovered by HERSCHEL I. 1779 October 17, and, as the distance was between $4''$ and $8''$, it was placed in his Class II. Both angle and distance were measured, and the latter recorded as $4''.354$ "mean measure" (*Phil. Trans.* 1782). In his "Synopsis" of his father's double-star observations (*Mem. R.A.S.* Vol. XXXV) HERSCHEL II. gives this distance as $4''.69$, and the date a few days later than that in the original publication, and the date of the measure of the position angle as 1781.73. The latter would seem to be a mistake, since HERSCHEL I. has only the single observation of 1779 October 19 in his first catalogue above referred to. There may be some warrant for this in the original MS., and for increasing the distance to $4''.69$; but the smaller distance value is used in *Herschel and South's Catalogue* of 1824, and in the early measures of DAWES and other observers. I have used here the original values of both distance and epoch.

In 1804 HERSCHEL recognized the angular motion, and said: "The stars being of nearly equal magnitude, we can have no inducement to suppose them to be at very different distances from us." STRUVE made measures of it in 1819 and 1821 before the commencement of the work recorded in *Measures Micrometricæ*, and SOUTH and HERSCHEL have a single observation in 1821. After citing the previous measures, the latter observers say: "No doubt, therefore, can remain of the reality of an angular motion in this star, as announced by SIR WILLIAM HERSCHEL in 1804; and the observations here brought together prove it to have been hitherto nearly uniform, and averaging $0''.579$ per annum in the direction *npsf*, or retrograde. There can be little doubt of its being a binary system—a miniature of a *Geminorum*."

Systematic work on this star was commenced by STRUVE in 1828, and since that time there is no lack of carefully made reliable mean results from measures on different nights down to the present time. The retrograde motion recognized by the early observers has steadily continued, accompanied with a slow diminution in the distance. According to STRUVE, the magnitudes of the components are 5.0 and 5.1.

On the accompanying diagram I have given a careful selection of the best measures by the principal observers for the last hundred years. The



following dates and observers are represented by complete measures of angle and distance :

1781	1 <i>u</i>	H ¹
1820	2 <i>u</i>	Σ
1821	1 <i>u</i>	Sh
1828-36 (4)	13 <i>u</i>	Σ
1840	6 <i>u</i>	Da
1848	1 <i>u</i>	Da
1855	15 <i>u</i>	J
1858	3 <i>u</i>	J
1863	7 <i>u</i>	J
1866	6 <i>u</i>	J
1868	3 <i>u</i>	Du
1871	11 <i>u</i>	OΣ, Du
1872	7 <i>u</i>	J
1875	7 <i>u</i>	Du
1876	3 <i>u</i>	Jed
1877	8 <i>u</i>	Hall
1879	3 <i>u</i>	Jed
1883	10 <i>u</i>	Per, En, Jed
1885	7 <i>u</i>	Hall, Per, Jed
1886	3 <i>u</i>	Jed
1888	3 <i>u</i>	Maw
1889	10 <i>u</i>	β, Hall, Maw
1893	7 <i>u</i>	Leavenworth, Comstock
1895	10 <i>u</i>	See, Collins, Comstock

It is evident that the distances in the early measures of STRUVE, and HESCHEL and SOUTH, 1819 to 1821, are too large, or that the distance in 1781

is too small. The later measures of STRUVE appear to show that his previous measures of distance were much too large, and he seems to have considered them as not very reliable, since they are not mentioned in *Mensura Micrometrica*.

One orbit has been computed for this system. BERBERICH (*Astr. Nach.* 2582), from an examination of the measures down to 1883, found a period of 648.0 years. As in all double stars as wide as this, and as easy of measurement, where the observed arc is short, the various measured positions are well represented by the apparent orbit; and, so far as the agreement between the observed and computed places is concerned, there is nothing for unfavorable criticism; but it is obvious enough from even a casual inspection of the diagram that the data are altogether insufficient for even the roughest approximation to the apparent ellipse and the elements of the real orbit. Indeed, as might be expected, the measures since 1883 are steadily leaving the computed positions. The chances are that the relative change will finally resolve itself into orbital motion; but, judging from the motion in the last hundred years, it will be a very long time before anything more than the bare fact of physical connection can be established, to say nothing about the details of that relation.

By way of showing how easily these positions are represented by orbits wholly unlike in all respects, I have given on the diagram two of the

β 956. O. Arg. S. 16420

R.A. 17^h 4^m 16^s 1
Decl. -26° 33' 3"

1880.51	163.1	0.63	8.0...	9.7	20	β
1893.49	161.1	0.76	8.0...	8.5	10	W
1897.65	163.3	0.58	7.5...	8.5	10	See

This difficult pair was suspected with the 6-inch in 1873 at the time of the discovery of β 125, and referred to in the note to the latter pair. It proved to be a very difficult object to verify, although it was examined many times with both the 6 and 18½-inch refractors. Finally in 1880 it was fairly well seen and measured with the larger aperture. This star is 3^m 49' ρ and 8' s of the well-known pair, 36 *Ophiuchi*. β 125 is 20' s .

[β (XIII)... β ... β (*Mon. Not.* XXXI, 183. See 3494)...
Wilson ()...]

 β 125. R.A. 17^h 4^m 15^s 1

R.A. 17^h 4^m 15^s 1
Decl. -26° 33' 3"

1877.42	62.9	1.74	7.2...	11.0	20	Cin
1880.51	68.3	1.50	7.9...	10.9	20	β
1889.47	61.3	1.48	7.9...	10.6	30	β
1897.65	67.1	1.65	6.6...	10.2	20	See

Discovered with the 6-inch. Further measures are necessary to show whether or not there is any relative motion. It is 3^m 16' ρ and 28' s of 36 *Ophiuchi*. β 956 is 20' n .

[β (III)... β (*Mon. Not.* XXXI, 101)... β ... β (2457)... β (*Mon. L. O. II*)...Cin*...See (3496).]

 β 1247. Lalande 31341

R.A. 17^h 7^m 2^s 0
Decl. -26° 5' 0"

1891.48	345.5	1.62	8.0...	10.3	40	β
1897.66	339.6	1.39	7.8...	10.8	30	A

Discovered with the 36-inch.

[β (XIII)... β (1155)... β (256) (*L. O. II*)...Arthur (1905)...]

 β 282. S.D. (14) 14585

R.A. 17^h 8^m 31^s 1
Decl. -14° 27' 3"

1875.41	154.1	4.23	6.7...	11.8	30	J
1879.55	153.2	3.31	7.5...	11.6	10	Cin
1879.81	154.8	3.04	6.2...	11.6	30	β
1880.44	153.1	4.25	6.0...	10.5	10	Cin
1881.42	151.7	4.41	6.6...	11.1	30	β
1889.42	151.0	4.31	6.3...	10.3	30	β
1896.57	153.7	4.28	...	...	20	Hu

Discovered with the 18½-inch. Evidently unchanged. This star, considering its brightness, is singularly missing in some of the star catalogues covering this region. Magnitude in LAMONT 5, GOULD 6.3, and S.D. 6.4. The Cincinnati observers thought the principal star was a close pair. I have examined it many times under favorable conditions with apertures of 15½, 18½, and 36 inches, and am satisfied that it is not double.

[β ... β (*Mon. Not.* XXXI, 101)... β ... β (2457)... β (*Pub. L. O. II*)...Cin*...Cin*...J...Hass... β (3496).]

 β 957. Lalande 31341

R.A. 17^h 8^m 38^s 1
Decl. -14° 10' 0"

1880.16	203.6	0.58	7.9...	7.9	30	β
1887.74	194.5	...	...	...	30	Sp
1888.54	199.5	0.5	8.0...	8.2	10	IV
1889.50	203.7	0.47	8.2...	8.4	30	β

Discovered with the 18½-inch. Apparently with out change.

[β (XIII)... β (1247)... β (256) (*L. O. II*)... β (1000)... β (3496).]

 β 958. Lalande 31341

R.A. 17^h 8^m 28^s 1
Decl. -14° 12' 0"

1880.42	221.0	1.48	8.3...	8.8	20	β
1888.45	216.2	1.37	8.3...	9.2	15	IV
1892.39	230.9	1.38	8.3...	8.7	30	β
1897.66	212.9	1.04	8.5...	9.1	10	See
1898.41	213.6	1.60	8.7...	...	30	A

Discovered with the 18½-inch. Without sensible change.

1890.44 314.8 1.45
1890.46 315.4 1.61
1890.50 315.8 1.87 6.0... 7.2 3m Sel

β 44. 1.26 300 years.

R.A. 17^h 37^m 10^s
Decl. — 32° 35'

1890.40	315.0	1.50	7.80	41.2	2m	O2
1890.43	316.6	1.51	6.2...	10.5	3m	J
1890.44	316.8	1.83	8.4...	10.5	3m	1A

Discovered with the 6-inch. Unchanged.

1890.43 316.6 1.51 6.2... 10.5 3m J
1890.44 316.8 1.83 8.4... 10.5 3m 1A
1890.46 315.4 1.61

β 1110. 1133. 3500.

R.A. 17^h 37^m 10^s
Decl. — 32° 35'

1890.40	315.0	1.50	7.80	41.2	2m	β
1890.43	316.6	1.51	6.2...	10.5	3m	A
1890.44	316.8	1.83	8.4...	10.5	3m	800

Discovered with the 12-inch.

1890.44 316.8 1.83 8.4... 10.5 3m 1A
See (3496)...]

β 416. 3000 185

R.A. 17^h 37^m 10^s
Decl. — 32° 35'

λ 366 B

1890.40	315.0	1.50	7.80	41.2	2m	β
1890.43	316.6	1.51	6.2...	10.5	3m	111
1890.44	316.8	1.83	8.4...	10.5	3m	Rus
1890.46	315.4	1.61	6.4...	10.5	3m	β
1890.47	315.8	1.87	6.2...	10.5	3m	101
1890.48	316.2	1.91	6.4...	10.5	3m	Sel
1890.49	316.6	2.00	6.4...	10.5	3m	β
1890.50	317.0	2.10	6.4...	10.5	3m	β
1890.51	317.4	2.20	6.4...	10.5	3m	Sel
1890.52	317.8	2.30	6.4...	10.5	3m	Bar
1890.53	318.2	2.40	6.4...	10.5	3m	Sel
1890.54	318.6	2.50	6.4...	10.5	3m	Com

1890.55	322.2	3.43	6.0...	7.6	3m	Sel
1890.56	323.4	3.60			1m	See
1890.44	314.8	1.45			3m	A
1890.46	315.4	1.61			3m	Scott
1890.50	315.8	1.87	6.0...	7.2	3m	Sel
1890.60	314.0	1.26			1m	Com
1890.48	307.0	1.60	7.1...	8.2	1m	See
1890.49	309.1	2.00			3m	A
1890.47	308.8	1.80			3m	Se
1890.47	310.2	1.80			3m	Lehman
1890.45	313.8	1.90	6.5...	7.3	3m	A
1890.38	313.2	1.83	6.4...	7.1	3m	A

A and C. H 4935

1890.47	310.2	1.80			3m	H
1890.48	310.6	1.91			3m	β
1890.49	311.0	2.02			3m	Ru
1890.50	311.4	2.13			3m	β
1890.51	311.8	2.24			3m	β
1890.52	312.2	2.35			3m	β
1890.53	312.6	2.46			3m	Bar
1890.54	313.0	2.57			3m	Com
1890.55	313.4	2.68			3m	See
1890.56	313.8	2.79			3m	A

The duplicity of the principal star of the wide pair, H4935, was discovered with the 6-inch. This is now known to be one of the most interesting and remarkable systems in the heavens. In the twenty-two years following the discovery of the close pair the companion has passed over an arc of about 300°, and a whole revolution will soon be completed. Several orbits have been computed. The dates in the first column give the last measures used.

1892	Gore	34.48 years	<i>Mou. Not.</i> L111, 345
1892	Glaserapp	34.85 "	<i>Astr. Nachr.</i> P. XII, 492
1892	Burnham	24.7 "	<i>Pub. L. O. II, 247</i>
1893	Glaserapp	32.23 "	<i>Proc. Soc. N. S. Wales</i> , June, 1893
1893	See	33.9 "	<i>Evolution of the Stellar Systems</i> , I

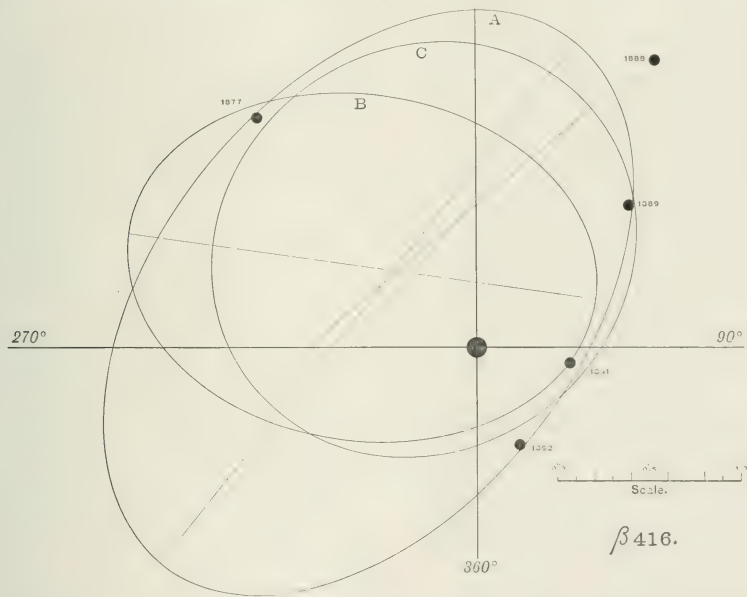
The first three orbits, which are based upon the same measures, are shown on the accompanying diagram (marked respectively A, B, and C repro-

duced from *Pub. L. O.* II, pp. 245, 247). It will be seen that the first ellipse best represents the later measures.

This system is of additional interest by reason of its large proper motion of $1'.15$ in the direction of $98^\circ.1$ (PORTER). This movement and the rapid angular motion in connection with the comparatively large apparent distance between the components, suggests the possibility of this system having

a considerable parallax. This should be investigated by observers in the southern hemisphere.

In Fig. 2 I have given the principal measured positions down to 1899. While the general form of the apparent orbit is fairly well indicated, an investigation of this time could give only a provisional value. A revolution will soon be completed, and then a reliable determination of the elements can be made.



The distant star, noted by HERSCHEL at the Cape of Good Hope, was not measured by him, and the angle only estimated from a diagram. The foregoing are all the measures I have found of this star. The measures since 1889 show beyond question that this star is moving in space with the close pair, and that the three form a triple system. SEE measures at 13.2 in star 20, 1, 35, 1, 10, 9, 7, 38, 146.

The principal star is B.A.C. 5825 (= LACAILLE 7215). The different estimates of magnitudes are

not very accordant; in B.A.C. 6; GOULD 6.1; YARNALL 7.0; CAPE 7.6.

[3.5 VOL. 3, 210, 2057, 211, 3125, 3. 10, 11, 3. (Sid. Mem. X, 489) (At. & A. P. XII, 702)... Russell (Pub. Obs. 1891) (Mem. R. A. S. 1)... Sellors (3154, 3240, 3274, 3303, 3369)... Barnard (A. J. 447)... Comstock (Pub. Obs. 1891)... See (A. J. 38, 372, 378)... See (A. J. 38)... Lehman (At. Soc. Pac. IX, 141)... Everett (Mon. Not. R. A. S. 1891)... See (A. J. 38)... See (A. J. 38)... LIX, 427)... Innes (A. J. 385) (Mon. Not. R. A. S. 1891)... Aitken (3306, 3405, 3585)... Aitken ()...]

either companion. This is a naked-eye star in *Ophiucus*; GOULD 6.1 m. B.A.C. 5839.

[β (III)... β (*Mon. Not. XXIV*, 50)... β (*Pub. L. O. II*)... δ (1)... δ (2086)... Cin^4 ... Cin^5 ... L^4 ... Wilson (*Cin*⁶)... Sp (II)...Hough (2978)...Glasesapp (I)...Scott (*Brit. Ast. Ass.* VIII, 66)...Doolittle (*Pub. Flower Obs.*, I)...]

β 629. D.M. (32¹) 2883

R.A. 17^h 13^m 05^s *l*
Decl. + 32° 13' *V*

1878.40	345.8	0.99	8.3...	9.0	2 <i>u</i>	β
1890.62	340.9	1.05	...	...	1 <i>u</i>	Sp
1891.31	343.8	1.01	8.5...	8.8	3 <i>u</i>	β
1892.39	343.9	1.02	8.4...	8.7	3 <i>u</i>	β
1895.56	343.8	0.95	...	...	1 <i>u</i>	Sp
1898.65	344.1	0.97	...	...	2 <i>u</i>	<i>Br</i> <i>w</i>
1898.70	344.1	1.20	...	...	2 <i>u</i>	<i>Bry</i>

Discovered with the 18½-inch. No sensible motion.

[β (X)... β ... β (3114, 3142) (*Pub. L. O. II*)... Sp (III)... Bowyer and Bryant (*Mon. Not. LIX*, 400)...]

β 127. Lalande 31151

R.A. 17^h 13^m 28^s *l*
Decl. + 27° 13' *V*

1876.51	95.3	5.26	8.2...	9.0	2 <i>u</i>	<i>Cin</i>
1877.53	93.8	5.16	8.5...	9.5	1 <i>u</i>	<i>Cin</i>
1879.47	93.7	4.85	8.0...	8.5	1 <i>u</i>	<i>Cin</i>
1890.42	97.1	4.91	8.8...	6.6	2 <i>u</i>	<i>Gl</i>
1896.52	86.4	5.27	...	...	2 <i>u</i>	<i>Sc</i>
1897.49	93.2	4.92	7.8...	8.7	1 <i>u</i>	<i>See</i>
1898.47	93.0	5.04	8.2...	9.5	3 <i>u</i>	<i>A</i>

Discovered with the 6-inch. Apparently unchanged.

β (III)... β (*Mon. Not. XXIV*, 50)... Cin^4 ... Cin^5 ... Glasesapp (I)...Scott (*Brit. Ast. Ass.* VIII, 66... See (3499)...Autken (3585)...]

β 45. W. XVII. 315

R.A. 17^h 13^m 29^s *l*
Decl. + 32° 37' *V*

1873.47	289.3	5.04	8.0...	8.5	1 <i>u</i>	$\text{O}\Sigma$
1874.43	287.0	4.84	9.0...	9.5	1 <i>u</i>	<i>WS</i>
1875.05	289.9	4.83	9.7...	1.3	1 <i>u</i>	<i>J</i>
1892.40	289.8	4.98	8.6...	8.8	2 <i>u</i>	β

Discovered with the 6-inch. No relative motion.

[β (II)... β (*Mon. Not. XXIV*, 351)... β (3142)... β (*Pub. L. O. II*)... δ (1)...Wilson and Seabroke (*Mem. R. A. S. XLIII*)... $\text{O}\Sigma$ (*Poulkova Obs.*, X)...]

β 628. W. XVII. 359

R.A. 17^h 13^m 55^s *l*
Decl. + 32° 47' *V*

1878.41	365.6	0.54	9.0...	9.5	1 <i>u</i>	β
1889.69	358.9	0.47	...	...	1 <i>u</i>	Sp
1892.30	358.6	0.52	8.7...	9.3	3 <i>u</i>	β
1892.64	362.9	0.5±	...	...	1 <i>u</i>	Sp
1895.51	361.5	0.35	...	...	1 <i>u</i>	Sp
1898.71	354.2	0.46	...	...	1 <i>u</i>	<i>Br</i>

Discovered with the 18½-inch. This pair, β 45, β 629, and β 630 are all in the same vicinity, and near 68 *Herculis* ($\text{O}\Sigma$ 328).

[β (XI)... β ... β (3142)... β (*Pub. L. O. II*)... Sp (III)...Bowyer and Bryant (I)...]

β 630. D.M. (32¹) 2891

R.A. 17^h 13^m 16^s *l*
Decl. + 32° 28' *V*

1878.40	225.4	1.66	8.7...	10.7	2 <i>u</i>	β
1892.33	224.8	1.45	8.5...	9.6	3 <i>u</i>	β
1898.65	225.1	1.42	...	...	2 <i>u</i>	<i>Br</i> <i>w</i>
1898.71	221.9	1.55	...	...	2 <i>u</i>	<i>Bry</i>

Discovered with the 18½-inch. Apparently no change.

[β (XI)... β ... β (3142)... β (*Pub. L. O. II*)...Bowyer and Bryant (*Mon. Not. LIX*, 400)...]

β 959. *Ophiuchi* 185

R.A. 17^h 16^m 49^s *l*
Decl. + 5° 7' *V*

1879.54	254.7	3.87	7.0...	10.0	1 <i>u</i>	<i>Cin</i>
1879.88	258.7	3.29	7.1...	12.8	5 <i>u</i>	β
1891.48	257.3	3.45	7.2...	11.7	5 <i>u</i>	β
1898.67	256.0	3.33	...	...	2 <i>u</i>	<i>Br</i>

Discovered with the 18½-inch. There is no relative motion. LALANDE 31588

[β (XII)... β ... β (3144)... β (3145)... β (*Pub. L. O. II*)...Bowyer and Bryant (I)...]

β 1228. *W. & G. 1149.*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

Right ascen.	Decl.	R.A.	Dec.	1850	β
1891.7	35.8	8	10	20	A

Discovered with the 36-inch.

Discovered by Lewis (M. & N. 1489), 52000 (1885)...]

 β 242. *Lalande 11616*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

A and B

1874.43	35.8	0.66	8.2...	3.8	J
1875.01	35.8	0.62	8.0...	3.8	Sp
1875.68	35.8	0.62	8.0...	3.8	Ly
1876.49	35.8	0.69	8.2...	3.8	Ly
1877.53	35.8	0.69	8.2...	3.8	Ly
1878.64	35.8	0.69	8.2...	3.8	Br

AB and C

1876.01	35.8	8.00	...	11.0	45	J
1888.50	64.6	0.66	...	11.2	18	Ly
1891.37	62.0	0.64	...	11.3	18	Ly
1892.48	64.8	0.62	...	11.3	18	Br

A and T

1876.01	35.8	0.66	...	11.0	45	J
1892.48	64.8	0.62	...	11.3	18	Ly
1892.48	64.8	0.62	...	11.3	18	Br

Discovered with the 6-inch. The measures show no change in any of the companions.

Discovered by Lewis (M. & N. 1489), 52000 (1885)...]
[S. C. J. 278] (Proc. Harvard Coll. Obs., 1892)...Brown

 β 1284. *W. & G. 1151.*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

Right ascen.	Decl.	R.A.	Dec.	1850	β
1891.7	35.8	8	10	20	A
1891.7	35.8	8	10	20	B

Discovered with the 36-inch.
but not included in my cata-
logue as it was not [discovered] [discovered]

36-inch in 1885 and not found, but it now appears that the declination used was not too small. In the measures by Lewis (M. & N. 1489), post this is called β 46. There is no indication of change.

 β 46. *W. & G. 1150.*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

1874.43	35.8	0.66	8.2...	3.8	10	WS
1875.01	35.8	0.62	8.0...	3.8	40	J
1875.68	35.8	0.62	8.0...	3.8	20	Ho
1876.49	35.8	0.69	8.2...	3.8	10	Ly
1877.53	35.8	0.69	8.2...	3.8	10	Lew
1878.64	35.8	0.69	8.2...	3.8	20	Br

Discovered with the 6-inch. Relatively fixed. It is the ρ star of a small equilateral triangle; the f star is Σ 2159.

18 (1) β 46. W. & G. 1150. Wilson and Scudlark (M. & N. A. S. XIII)...J (1)...Hough (278)...Ly (A. J. 278) (Proc. Harvard Coll. Obs., 1892)...Lewis (Gr. Obs., 1894)...Brown (...)]

 β 128. *B.A.C. 5879.*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

1876.56	327.3	3.66	8.0...	10.0	10	Cin
1877.53	327.3	1.10	7.5...	9.7	20	Cin
1891.56	328.0	4.04	7.7...	10.3	30	β
1897.68	322.8	3.97	7.2...	10.2	20	See

Discovered with the 6-inch. Probably fixed. It had been previously seen by the Harvard observers, but published long after β (11).

18 (1) β 128. W. & G. 1151. Wilson and Scudlark (M. & N. A. S. XIII)...J (1)...Hough (278)...Ly (A. J. 278) (Proc. Harvard Coll. Obs., 1892)...Lewis (Gr. Obs., 1894)...Brown (...)]

 β 1240. *Brunner 3247.*

R.A. 17^h 18^m 10^s 10
Decl. δ 35° 47' 30"

A and B

1891.43	82.1	0.44	8.5...	9.6	30	β
1891.71	82.3	0.46	...	...	10	A
1898.71	82.2	0.49	...	...	10	Br

AB and C

1891.43	82.1	0.44	8.5...	9.6	30	β
1891.71	82.3	0.46	...	...	10	Br

Discovered with the 12 inch. A and C are respectively D.M. (53°) 1938 and D.M. (54°) 1875.

[β (XVIII)... β (3118)... β (Pub. L. O. II)... Aitken (A. J. 429)
... Brown ()...]

 β 1250. W. XVII. 439

R.A. 17^h 20^m 12^s 9
Decl. + 32° 42' 3

1877.26	57.0	1.93	10.3...	10.8	3 ^u	J
1884.65	60.2	1.41	8.7...	8.7	2 ^u	Ho
1891.72	63.7	2.02	9.4...	9.5	2 ^u	β
1896.99	68.9	2.23	...	...	2 ^u	Lew
1897.58	67.5	1.84	...	...	2 ^u	How
1897.71	64.8	1.99	...	...	3 ^u	A
1898.70	64.2	2.26	...	...	2 ^u	Brw
1898.70	65.7	2.18	...	...	1 ^u	Lew

Discovered with the 6-inch May 31, 1876, but not included in my catalogues of new pairs published at that time. It is the δ star of a small equilateral triangle, all in the field. The magnitude in D.M. is 8.5.

[β (XVIII)... β (3118)... β (Pub. L. O. II)... Aitken (A. J. 429) H (2978)... Aitken (A. J. 429)... Lewis, Brown and Brown (Mon. Not. LIX, 400)...]

 β 129 = β 1120. P. XVII. 439

R.A. 17^h 21^m 13^s 9
Decl. - 25° 24' 3

1877.41	100.2	0.96	7.5...	8.0	1 ^u	Cin
1879.34	98.8	1.06	8.0...	8.0	1 ^u	Cin
1880.59	279.4	1.10	7.5...	8.0	3 ^u	Sp
1889.14	100.0	0.93	7.0...	7.7	3 ^u	β
1890.50	103.3	...	7.2...	8.0	2 ^u	Cl
1893.65	100.2	0.86	7.1...	7.1	2 ^u	Sel
1897.57	99.0	0.93	7.1...	7.1	3 ^u	A
1897.65	106.4	1.02	8.1...	8.4	1 ^u	See

Discovered with the 6-inch, and inadvertently put as new in β (xvi). Apparently without change. This is B.A.C. 5896.

[β (XVIII)... β (3118)... β (Pub. L. O. II)... Aitken (A. J. 429) L. O. II... Cin⁴... Cin⁵... Sp (III)... Glasenapp (I)... Sellors (3240)... Aitken (3465)... See (3499)...]

 β 1890. W. XVII. 439

R.A. 17^h 20^m 12^s 9
Decl. - 32° 42' 3

1888.61	354.2	0.65	6.8...	6.8	3 ^u	β
1897.52	354.6	0.92	7.0...	7.0	3 ^u	A

Discovered with the 12-inch. There may be a change in the angle. Lalande 31816.

[β (xv)... β (2929)... β (Pub. L. O. II)... Aitken (3465)...]

 β 1201. O. XVI. 439

R.A. 17^h 26^m 17^s 9
Decl. - 57° 42' 3

1890.49	338.2	0.43	7.8...	7.8	3 ^u	β
1898.62	340.4	0.43	7.9...	7.9	3 ^u	A

Discovered with the 36-inch.

[β (xv)... β (2929)... β (Pub. L. O. II)... Aitken (3465)...]

 β 1090. β Draconis

R.A. 17^h 26^m 17^s 9
Decl. + 52° 23' 3

1889.26	13.4	3.97	3.1...	3.1	4 ^u	β
1890.34	12.8	4.18	3.1...	3.1	3 ^u	β
1891.31	12.3	4.06	3.1...	3.1	3 ^u	β
1892.32	13.7	4.04	3.1...	3.1	3 ^u	β
1893.31	12.2	4.27	3.1...	3.1	3 ^u	β

The minute attendant to β Draconis was discovered with the 36-inch. It is beyond the reach of all but the largest refractors. ADW'S latest value of the proper motion of the bright star is 0.0196 in the direction of 290.9. This movement is small, but if the small star was fixed in space, it would increase the position-angle 2.5 in the interval between 1889 and 1898. The measures do not seem to indicate any such change in the direction of the companion, and the probabilities are that it is moving with the primary.

[β (xv)... β (2929, 3048, 3114, 3142)... β (Pub. L. O. II)...]

 β 1121. D.M. 412 & 5201

R.A. 17^h 20^m 12^s 9
Decl. + 12° 42' 3

1889.14	249.1	0.71	8.5...	8.5	3 ^u	β
1892.64	242.4	0.69	...	...	3 ^u	Sp
1898.67	236.0	0.61	8.4...	8.5	3 ^u	A
1897.00	248.0	0.66	...	...	3 ^u	Lew
1897.26	244.2	0.73	...	...	3 ^u	Brw
1897.71	246.8	0.64	...	...	3 ^u	A

Discovered with the 36-inch. Change uncertain.

[β (xvi)... β (2056)... β (Pub. L. O. II)... Sp (III)... Aitken (3465)... See (3499)...]

β 960. Lalande 32207

$$\frac{RA}{Dec} = \frac{17^h 35^m 40^s}{-3^{\circ} 25' 30''}$$

1879.00	188.9	1.31	8.4	11.3	40	β
1879.07	189.2	1.32	8.3	11.4	38	β
1879.10	189.5	1.34	8.0	11.8	30	A
1879.12	189.7	1.34			20	B

Discovered with the 18 $\frac{1}{2}$ -inch.

... β (Pub. L. O. II)... Aitken (3585)

 β 962. 20 Delianiti

$$\frac{RA}{Dec} = \frac{17^h 35^m 40^s}{-3^{\circ} 25' 30''}$$

1879.00	188.9	1.31	8.4	11.3	40	Cin
1879.07	189.0	1.32	5.5	10.1	40	β
1879.10	189.1	1.33	5.8	10.2	30	β
1879.12	189.3	0.95		4.0		β
1879.37	189.8	0.81		3.0		β
1879.41	189.7	0.78		3.0		β
1879.41	189.6	0.62		2.0		β
1879.41	189.5	0.58		1.0		Bat
1879.70	189.7	0.47	12.2	1.0	17	A

1879



Discovered with the 18 $\frac{1}{2}$ -inch. The principal star has a proper motion of 0 $^{\circ}$ 58' in the direction of 0 58 7 (Russe Observations), and it was therefore certain at the time of my second set of measures in 1881, that this was a binary system from the common proper motion of the components. The distance has been steadily decreasing, and it is now (1898) an extremely difficult pair. This is principally due to the great difference in the magnitudes of the stars. It will probably be a very difficult pair to measure for some years. The several positions are shown on the accompanying diagram. Of course it is impossible at this time to say anything about the probable period.

[β (x), β ... β (3114)... β (Pub. L. O. II)... β (Sid. Mem. VIII, 356)... Cin... Barnard (A. J. 447)... Aitken (...)]

 β 631. Ophiuchi 155

$$\frac{RA}{Dec} = \frac{17^h 35^m 40^s}{-3^{\circ} 25' 30''}$$

1879.85	73.0	0.40	7.0	7.0	40	β
1883.34	81.2	0.42	7.0	7.0	40	Sp
1884.63	60.0	0.40			30	Sp
1886.65	61.8	0.36			70	En
1887.88	65.3	0.37		8.2	20	Sp
1888.50	57.2	0.43	7.0	7.0	20	Lv
1891.58	67.2	0.36	7.5	7.0	30	β
1895.68	69.8	0.37			10	Lew
1896.69	33.3	0.67			10	Dy
1898.47	244.3	0.87	7.2	7.2	20	Doo
1898.54	244.6	0.12	7.0	7.8	20	β

Discovered with the 18 $\frac{1}{2}$ -inch. A binary in slow retrograde motion. In Gould 6.4m. Lalande 32200.

[β (x)... β ... β (3114)... β (Pub. L. O. II)... Sp (II app)... Sp (III)... Engelmann (2786)... Lv... Lv (Sid. Mem. VIII, 77)... Lews and Dixon (Mem. A. S. 131, 150, 148, 149)... Green (Mem. A. S. 1845)... Doodittle (Pub. Flower 1894, 11)]

 β 961 — β 963. Lalande 32206

$$\frac{RA}{Dec} = \frac{17^h 35^m 40^s}{-3^{\circ} 25' 30''}$$

1879.62	111.1	8.62	6.0	11.5	70	β
1892.37	111.6	8.13	6.0	11.8	30	β

Discovered with the 18½-inch. Two minute stars, more distant, in the same quadrant. In GOULD 7.1 m.

[β (XIII)... β^* ... β (3142)... β (Pub. L. O. II)...]

β 1251. B.A.C. 5991

R.A. 17^h 30^m 35^s *t*
Decl. +16° 1' *v*

1884.61	90.2	1.2	6.0...	9.0	1 ⁿ	β
1891.56	79.0	1.37	6.0...	11.5	3 ⁿ	β
1896.51	84.9	1.25	...	...	1 ⁿ	Lew
1897.58	65.2	1.23	6...	11+	3 ⁿ	A
1898.48	71.5	1.42	6.2...	10.0	3 ⁿ	D
1898.67	69.1	1.41	...	...	1 ⁿ	Br

This pair was discovered with the 18½-inch at Chicago, but not included in any of the catalogues of new pairs issued at that time. This is a naked-eye star in *Ophiucus*; in D.M. 5 m; H&N 6 m; Harvard 5.7 m. The *Berlin A. G. Catalogue* gives the principal star a proper motion of 0".121 in the direction of 350°.4 (PORTER 0".115 in 360°). The relative change appears to be small, but it is certain that the two stars have a common proper motion and form a physical system.

[β (XVIII)... β (3113)... β (Pub. L. O. II)... AITKEN (3495)... Lewis (*Mon. Not. LIX*, 400)... DOOLITTLE (*Pub. Flower Obsv.* 1)... BROWN (...)]

β 824. D.M. (1) 3100

R.A. 17^h 42^m 41^s *t*
Decl. -1° 50' *v*

1881.40	350.9	0.67	8.5...	8.6	3 ⁿ	β
1888.54	349.4	0.69	8.8...	8.9	4 ⁿ	Com
1898.67	351.3	0.63	...	...	1 ⁿ	Br

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)... β^* ... Comstock (*Pub. Washburn Obsv.* 311)... BROWN (...)]

β 358. W & XVII 1371

R.A. 17^h 13^m 10^s *t*
Decl. +31° 32' *v*

1879.37	202.8	4.29	8.2...	9.5	2 ⁿ	Cin
1892.39	206.1	4.22	8.5...	11.5	1 ⁿ	β

Discovered with the 6-inch.

[β (VI)... β (2062, 3142)... β (Pub. L. O. II)... CIN...]

β 632. Lalande 32099

R.A. 17^h 45^m 32^s *t*
Decl. +31° 19' *v*

A and B

1877.97	343.6	5.46	6.3...	12.5	1 ⁿ	β
1882.53	344.0	5.48	7.0...	12.0	1 ⁿ	Ho
1892.52	344.5	5.25	7.0...	12.5	1 ⁿ	Ho
1899.39	343.9	5.46	...	12.7	2 ⁿ	β

A and C (OS 336 *ref.*)

1843.31	164.0	44.66	...	...	1 ⁿ	Ma
1866.86	164.9	43.16	6.3...	10.3	3 ⁿ	Δ
1877.97	164.9	42.80	...	...	1 ⁿ	β
1892.52	164.5	...	...	10	1 ⁿ	Ho
1899.39	164.2	42.44	...	...	3 ⁿ	β

The faint companion to the principal star of this wide pair was detected with the 18½-inch. The three stars seem to be relatively fixed. The magnitude in D.M. is 6.5. All the measures of AC are given.

[β (XV)... β^* ... Hough (2478, 3234)... JACOBI... MAJESTIC (*Leopold Obsv.* XI)...]

β 1122. Cord. G. C. 24248

R.A. 17^h 44^m 38^s *t*
Decl. -28° 27' *v*

B and C

1889.39	175.2	1.31	10.4...	10.9	3 ⁿ	β
1897.61	176.6	1.47	...	...	3 ⁿ	A

A and B (Howe)

1877.57	10.3	6.39	8.0...	10.0	1 ⁿ	Cin
1880.44	8.7	6.54	8.5...	9.8	2 ⁿ	Cin
1889.39	9.6	6.46	8.7...	...	3 ⁿ	β
1897.61	10.4	6.41	8...	12...	2 ⁿ	A

A and D

1897.61	357.0	12.32	...	12...	2 ⁿ	A
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The duplicity of Howe's companion was discovered with the 12-inch. There seems to be no change in its position with reference to the principal star. The fourth star, D, was added by AITKEN with the 12-inch.

[β (XVI)... β (2056)... β (Pub. L. O. II)... CIN... CIN... AITKEN...]

not show any change in the distance, and the two are probably moving together.

[β (1)... β^2 ... β^3 ... β (Alt. & A-P, XIII, 1)... β (Pub. L. O. II)...]

β 283. B.A.C. 6088

R.A. 17^h 54^m 38^s }
Decl. - 22° 47' }

A and B

1878.86	230.3	8.05	6.0...12.5	3 ^m	β
1892.39	238.6	8.17	6.0...13.0	2 ^m	β
1895.54	237.7	8.45	6.1...13.0	3 ^m	A

A and C

1892.39	34.4	14.10	...14	1 ^m	β
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The nearest companion was discovered with the 18½-inch, and the other added with the 36-inch. This is a naked-eye star in *Sagittarius*, about 15' *n* of the trifold nebula.

[β (1)... β (Mon. Not. XXXI, 31)... β ... β (1412)... β (Pub. L. O. II)...Atken (Alt. Soc. Pac. VII, 305)...]

β 1124. 67 *Ophiuchi*

R.A. 17^h 54^m 38^s }
Decl. - 25° 50' }

A and B

1890.39	195.6	6.79	5...14.8	3 ^m	β
1898.54	195.8	6.72	...	1 ^m	β

C and D (= β 341)

1878.57	129.2	8.46	9.0...13.0	1 ^m	β
1889.40	129.6	8.40	8.3...11.5	2 ^m	β
1898.54	128.7	8.16	...	1 ^m	β

A and C (= Sh 255)

1823.41	143.1	55.23	5.6...9	1 ^m	Sh
1849.94	142.7	54.47	4.2...8.0	3 ^m	O2
1875.59	142.8	54.83	4.2...7.6	4 ^m	J
1878.57	143.0	54.77	5.6...9	1 ^m	β
1886.34	142.9	54.29	4.4...8.4	7 ^m	En
1889.40	143.0	54.54	...	2 ^m	β

A and E

1878.57	179.8	45.94	...12	1 ^m	β
1898.54	178.0	45.66	...	1 ^m	β

The companion to A was discovered with the 36-inch, and the companion to C with the 18½-inch. The wide stars AC = H¹ VI. 2 = Sh 255 = OS (app) 162. These stars appear to be relatively fixed. The principal star has a small proper motion, 0.027 in the direction of 257.5 (AUWERS). The measures of B hardly cover a sufficient time to show whether or not that star is moving with the primary.

[β (X, XVI)... β^2 ... β (1412)... β (Pub. L. O. II)...]

The principal measures of AC are given. The following relate to the old components:

[β (1)...Engelmann (2786)...*Annalen Königsberg Sternwarte* XVI...Powell (*Mon. R. A. S.* XXX...*Astronomical Journal* XXI, XXXVIII...OS (Pulkova Obs. X, p. 36)...]

β 47. Lacaille 32978

R.A. 17^h 54^m 32^s }
Decl. - 10° 14' }

1875.74	208.3	1.84	8.9...10.9	4 ^m	J
1891.61	273.8	1.37	8.0...12.8	3 ^m	β
1893.82	273.0	1.46	...	5 ^m	Sp
1895.63	277.1	1.46	8.0...14.4	3 ^m	A
1896.55	273.2	1.64	8.1...10.8	3 ^m	Lv

Discovered with the 6-inch. It is a difficult pair with that aperture.

[β (1)... β (Mon. Not. XXXIII, 331)... β ...144... β (Pub. L. O. II)... β (1)...Sp (11)...Atken (*Alt. Soc. Pac.* VII, 305)...Lv (A. J. 497)...]

β 1202. D.M. 63 13504

R.A. 17^h 55^m 30^s }
Decl. - 3° 32' }

A and B

1891.48	353.1	0.74	8.2...9.3	3 ^m	β
1892.95	356.8	0.65	...	2 ^m	Sp
1895.56	362.5	0.60	...	1 ^m	Sp
1897.73	349.3	0.82	...	3 ^m	A
1899.26	353.8	0.58	8.5...9.5	1 ^m	β

C and D

1891.48	93.2	3.91	9.4...11.3	3 ^m	β
1899.26	94.0	3.87	9.5...11.5	1 ^m	β

AB and C

18898.30	13.7	0.00	5.1	3
18898.30	13.7	0.00	5.1	3

AB and E

18898.30	13.7	0.00	5.1	3
18898.30	13.7	0.00	5.1	3

Discovered with the 36-inch. A and E are respectively Lamont 2849 and 2852, but the declination of the latter should be 1' more. There is a 13m star, from C, 145.0 : 15.78.

[18898.30] 13.7 0.00 5.1 3
...Sp (III)...]

 β 1125. γ 5 (184444)

R.A. 17^h 20^m 33^s
Decl. $-24^{\circ} 15'$

18899.31	19.7	0.91	5.0	3
18899.31	19.7	0.91	5.0	3
1894.13	19.7	0.78	4.9	Sp
18899.31	19.7	0.91	5.0	A
1895.52	19.7	0.86	4.9	B
18899.31	19.7	1.02	5.2	A

Discovered with the 56-inch. The proper motion of the large star is very small, 0.012 in the direction of 256.6 (ATWERS). The relative change is slow, but there is not much doubt of these stars forming a physical system.

SCHAPARELLI finds the principal star a close pair, and from a single measure gives, 320.0 : 0.7 \pm (1892.66). There are no other observations of this, and I have had no opportunity to examine it under sufficiently favorable conditions since receiving recently the measures of Sp. It would seem to be a triple of extraordinary interest.

[18899.31] 19.7 0.91 5.0 3
...Sp (III)...]

 β 635. γ 5 (18000)

R.A. 17^h 20^m 33^s
Decl. $-24^{\circ} 15'$

A and B

18899.31	19.7	0.91	5.0	3
18899.31	19.7	0.91	5.0	3
18899.31	19.7	0.91	5.0	3
18899.31	19.7	0.91	5.0	3

A and C

18899.31	19.7	0.91	5.0	3
18898.50	12.2	0.91	5.0	A
18899.31	19.7	0.91	5.0	B

Discovered with the 18 $\frac{1}{2}$ -inch. There may be some change in the angle of AB. C is D.M. (1) 3000. The magnitudes of A and C in the D.M. are respectively 9.0 and 8.7.

[18899.31] 19.7 0.91 5.0 3
...Sp (III)...]

 β 1126. γ 5 (184444)

R.A. 17^h 20^m 33^s
Decl. $-24^{\circ} 15'$

A and B

18899.31	19.7	0.91	5.0	3
18899.31	19.7	0.91	5.0	3

AB and C (H 5009)

1837.70	20.8	2.1	10	H
1879.47	19.7	3.80	8.0	Cin
1880.58	19.9	3.86	9.0	Cin
1889.40	23.3	4.05	9.6	B
1899.51	21.2	3.87	8.2	A

The principal star of H 5009 was found to be a close pair with the 36-inch. This is in the cluster, *Messier* 8, and is described by HERSCHEL as "the star γ in the monograph of M 8" (*Cape Observations*). The above are all the measures of C.

[18899.31] 19.7 0.91 5.0 3
...Sp (III)...]

 β 825. γ 5 (184444)

R.A. 17^h 20^m 33^s
Decl. $-24^{\circ} 15'$

A and B

1881.37	19.7	11.41	8.4	B
1888.66	19.3	11.52	8.0	Cin
1889.47	19.6	11.55	11.5	B
1887.44	19.4	11.46	13.0	B
1898.38	19.1	11.85	8.0	D

A and C (Σ 2268 = S 699)

1829.70	218.2	18.13	8.0...	9.0	2 ⁿ	Σ
1866.52	214.0	19.32	8.1...	9.0	0 ⁿ	Σ
1881.37	212.5	20.08	8.4...	8.8	3 ⁿ	β
1889.47	211.0	20.00	8.5...	8.8	1 ⁿ	β
1891.44	211.4	20.24	8.3...	8.3	2 ⁿ	β
1898.38	210.7	20.63	...	...	5 ⁿ	D

B and C

1891.44	232.2	9.82	...	...	2 ⁿ	β
1898.48	231.0	9.30	...	...	3 ⁿ	D

The faint star nearly midway between the components of Σ 2268 was discovered with the 15½-inch at the Washburn Observatory. The change in AC is evidently due to the proper motion of one of these stars. Assuming that this is the principal star, the measures give a movement of about 0.05 in the direction of 350°.

[β (XIII)...β²...β (2957, 3114)...β (Ad. S. 1-1-1) XIII, 17...β (Pub. L. O. II)...Comstock (Pub. Washburn Obs. VI)...Doolittle (Pub. Flower Obs. I)...]

A few of the measures of AC are given. All will be found by the following references:

Madler (*Fixstern-Systeme* I) (*Dorpat Obs.* XI, XIII, XV)...
 d (II)...d (1572)...Sp (II)...Bigourdan (*Paris Obs.* 1883)
 ...Gledhill, Wilson and Seabroke (*Mem. R. A. S. XLII, XLVIII*)
 ...Pritchett (*Pub. Morrison Obs.* I)...Glaserapp (IV)...]

β 1127. Groombridge 2500

R.A. 17^h 48^m 57^s 1
 Decl. + 41° 14′ 3″

1889.53	144.7	0.80	7.8...	9.7	3 ⁿ	β
1895.65	147.4	0.86	7.8...	10.2	3 ⁿ	A
1897.71	130.5	0.88	...	...	3 ⁿ	A
1897.75	147.0	0.57	...	...	1 ⁿ	Lew
1898.61	139.6	0.74	...	...	1 ⁿ	How
1898.70	135.0	0.76	...	...	1 ⁿ	Lew

Discovered with the 12-inch. Change is still uncertain. The magnitude in D.M. is 6.5, and in RADCLIFFE 7.2.

[β (XVII)...β (2950)...β (Pub. L. O. II)...Adams (L. J. 1890) (*Ast. Soc. Pac.* VII, 305)...Lowis and Bowen (*Mem. Am. LIX, 400*)...]

β 243. O. Arg. S. 19762

R.A. 18^h 00^m 55^s 1
 Decl. - 22° 17′ 3″

A and B

1878.58	125.8	0.84	8.0...	8.7	2 ⁿ	Cin
1881.58	123.3	0.76	8.2...	8.2	3 ⁿ	β
1897.05	124.1	0.52	7.9...	8.3	1 ⁿ	See
1898.52	125.4	0.92	7.9...	8.0	3 ⁿ	D

A and C

1898.52	56.5	40.17	...	9.0	3 ⁿ	D
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Discovered with the 6-inch. Evidently unchanged.

[β (V)...β (Mon. Not. XXXV, 31)...β²...Cin⁴...Cin⁵...See (3496)...Doolittle (Pub. Flower Obs. I)...]

β 244. Lalande 33188

R.A. 18^h 10^m 17^s 1
 Decl. - 27° 53′ 3″

1876.56	261.1	2.06	8.0...	9.0	1 ⁿ	Cin
1877.55	255.5	2.22	8.0...	9.0	2 ⁿ	Cin
1880.58	257.3	2.01	...	...	1 ⁿ	Cin
1881.59	258.2	2.03	8.0...	9.8	3 ⁿ	β
1892.54	257.0	2.04	8.0...	10.3	2 ⁿ	Lv
1897.63	257.6	2.38	7.0...	9.0	3 ⁿ	See

Discovered with the 6-inch. Probably fixed.

[β (V)...β (Mon. Not. XXXV, 31)...β²...Cin³...Cin⁴...Cin⁵...See (3496)...Doolittle (Pub. Flower Obs. I)...]

β 418. O. Arg. N. 17817

R.A. 18^h 10^m 28^s 1
 Decl. - 00° 04′ 26″ 3

1879.29	227.9	14.33	8.2...	12.0	1 ⁿ	β
1893.44	228.1	14.02	8.5...	12.3	3 ⁿ	W
1899.32	227.8	14.02	8.5...	11.3	1 ⁿ	β

Discovered with the 6-inch. No sensible change. There is an error of 180° in the angle as printed in β (XVII).

[β (XVII)...β (2131)...β (Washburn Obs. I)...]

These faint companions were noted with the 18½-inch. GLASENAPP measures from A three more distant stars:

1890.51	192.1	57.32	... 8.8	2n
1890.51	179.6	76.01	... 8.9	2n
1890.51	268.5	138.87	... 9.6	2n

COGSALL measures a 13.5 m star from A, 102° 9':

17 ^h 53 ^m (1898.67) 1n.
[β (A)... β (Mon. Abt. XXXV, 31)... β (1311)... β (Pub. L. O, II)...Glaseapp (I)...Cogsall (I)...]

β 285. O. Arg. N. 17953

R.A. 18 ^h 0 ^m 26 ^s 1
Decl. - 25 3 1

A and B

1874.66	317.2	1.5	8.0...11.0	1n	β
1877.59	316.4	1.47	8.5...10.0	1n	Cin
1880.47	315.7	1.75	8.8... 9.7	1n	β
1880.60	324.2	...	8.0...10.0	1n	Cin
1893.55	310.1	1.57	7.5... 9.8	1n	1A
1893.70	310.1	1.01	9.0...11.0	1n	W
1897.67	321.4	1.49	8.2...10.0	1n	See
1898.68	318.3	1.51	8.2...10.7	1n	Bd
1898.75	318.6	1.63	... 9.8	3n	D

C and D

1880.47	20.7	1.65	9.5...10.5	1n	β
1893.70	16.9	2.24	9.5...11.5	1n	W
1897.67	21.7	1.31	9...12	1n	See
1898.68	18.8	2.32	...11.7	1n	Bd
1898.75	18.0	1.99	...11.1	3n	D

A and C

1880.47	141.0	59.66	...	1n	β
1890.50	140.8	60.41	8.2... 8.7	2n	Gl
1893.70	141.0	60.05	...	1n	W
1898.68	140.5	59.70	8.2... 9.0	2n	Bd
1898.75	141.1	60.15	8.3... 8.8	3n	D

C and E

1893.70	115.6	39.72	... 12.0	1n	W
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This pretty quadruple was discovered with the 18½-inch. C is O. Arg. N. 17954.

[β (A)... β (Mon. Abt. XXXV, 31)... β (1311)... β (Pub. L. O, II)...Wilson (I)...See (1496)...Doolittle (Pub. L. O, II)...Glaseapp (I)...Cogsall (I)...]

β 760. η Sagittarii

R.A. 18 ^h 0 ^m 34 ^s 1
Decl. - 26 48 1

A and B

1879.67	99.9	2.85	3... 11.5	2n	β
1886.71	99.5	4.36	4... 11.1	1n	Pol
1889.41	107.0	3.51	... 11.4	4n	β
1895.72	99.2	3.60	5... 9.9	3n	Sel
1896.46	101.2	2.65	3.4... 11.4	2n	A
1897.38	105.3	3.87	3.5... 10	2n	See

A and C

1896.48	276.2	33.34	... 13+	2n	A
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A and D

1879.66	302.2	94.38	...	2n	β
1889.41	302.8	93.22	... 10	2n	β
1896.47	303.8	93.14	...	3n	A

Discovered with the 6-inch at Mt. Hamilton in 1879. The measures at that time are subject to error in distance. There is probably no material change in the close star. The bright star has a proper motion of 0".126 in the direction of 288°.4, according to the *Second Washington Catalogue*, and B appears to be moving with it. If fixed in space, the distance at the last measures would be 2½ more than at the time of discovery. The faint star, C, was noted by AITKEN with the 36-inch. The proper motion of A substantially accounts for the change in the position of the distant star, D.

[β (A)... β (1311)... β (Pub. L. O, II)...Wilson (I)...See (1496)...Doolittle (Pub. L. O, II)...Glaseapp (I)...Cogsall (I)...]

β 246. ϵ Cor. G. C. 24625

R.A. 18 ^h 10 ^m 34 ^s 1
Decl. - 16 32 1

1875.49	108.6	0.42	8.0... 8.8	6n	J
1877.57	101.4	...	8.0... 8.2	1n	Cin
1878.52	107.0	...	8.0... 8.5	1n	Cin
1880.47	102.0	0.40	7.8... 7.8	1n	β
1881.59	111.2	0.47	8.1... 8.1	3n	β
1881.61	117.3	0.47	8.0... 8.0	3n	Sp
1891.63	105.6	...	8.2... 8.2	2n	β
1898.67	107.0	...	8.0... 8.5	1n	C

This difficult pair was discovered with the 6-inch. These observations are recorded in reverse order. The first obtained (1878, A to B).

1878.12 214.4 20.40 10.0 10.3 10 β
 1879.04 214.2 20.38 9.6 11.2 10 C.M.
 1891.65 214.2 20.27 9.6 11.2 10 L.V.

β 463. S.D. (16") 4707

(R.A. 18^h 00^m 22^s)
 Dec. = 16° 25' 3"

1891.65 214.2 20.3 9.0 10.3 10 β
 1891.65 214.2 20.38 9.6 11.2 10 C.M.
 1891.65 214.2 20.27 9.6 11.2 10 L.V.

Discovered with the 6-inch.

1878.12 214.4 20.40 10.0 10.3 10 β
 1879.04 214.2 20.38 9.6 11.2 10 C.M.
 1891.65 214.2 20.27 9.6 11.2 10 L.V.

β 290. Latitude 33518

(R.A. 18^h 00^m 22^s)
 Dec. = 18° 31' 3"

A and B (= Sh 263)

1891.65 214.2 20.3 9.0 10.3 10 β
 1891.65 214.2 20.38 9.6 11.2 10 C.M.
 1891.65 214.2 20.27 9.6 11.2 10 L.V.

Band

1891.65 214.2 20.3 9.0 10.3 10 β

A and B

1891.65 214.2 20.3 9.0 10.3 10 β

A and B

1891.65 327.9 22.04 ... 10 β

A and B

1891.65 22.1 22.20 ... 10 β

A and B

1891.65 22.1 22.20 ... 10 β

A and B

1891.65 22.1 22.20 ... 10 β

A and B

1891.65 22.1 22.20 ... 10 β

A and B

The faint stars near this wide pair of South and H 126 301 were noted with the Washington 26-inch. All the measures of AB are given.

1891.65 22.1 22.20 ... 10 β
 1891.65 22.1 22.20 ... 10 β

β 630. Latitude 33612

(R.A. 18^h 00^m 22^s)
 Dec. = 18° 31' 3"

A and B

1878.66 155.3 0.57 7.2 ... 7.7 20 β
 1883.12 155.3 0.55 7.5 7.5 20 Sp
 1891.65 Single 36-inch β
 1892.36 Single 36-inch β
 1898.50 Elongated 355? 20 D
 1898.58 Unseen 10 A
 1899.49 214.2 20.27 9.6 11.2 10 A

C and D (= Sh 264)

1891.65 325.5 8.30 ... 13.5 20 β
 1898.50 322.4 7.55 ... 13.7 20 D
 1899.20 323.3 8.07 7.0 ... 13.8 30 A

AB and C (= Sh 264)

1823.45 52.6 16.42 7 ... 8 10 Sh
 1862.72 52.5 16.33 7.2 ... 8.7 10 H
 1877.60 52.2 17.37 7.2 ... 8.6 20 C
 1878.66 52.1 17.37 7.2 ... 8.6 20 β
 1879.27 52.4 17.40 6.0 ... 8.0 10 C
 1883.29 52.3 17.38 7.2 ... 8.0 30 Sp
 1890.50 52.2 16.67 7.2 ... 7.7 20 Gl
 1891.65 52.1 17.23 7.1 ... 7.7 20 β
 1893.58 52.3 16.95 6.9 ... 7.7 20 Sc
 1898.49 52.0 17.11 6.9 ... 7.7 30 D
 1899.03 52.2 17.27 6.9 ... 7.7 20 A

The faint star, D, was detected with the Washington 26-inch in 1874, and subsequently the principal star of the wide pair was found to be a close pair with the 18½-inch. If the distance in 1874 had not been less than at the time of discovery in 1878, I could hardly have missed it with the larger instrument. It is evidently in rapid motion. It was an easy pair in 1878, and entirely beyond the reach of the 36-inch under fine conditions in 1892.

The foregoing are all the measures of the South and HERSCHEL pair. These stars are evidently fixed.

[β (v, x)... β (Mon. Not. xxxv, 31)... β^1 ... β (3114, 3142)...
 β (Pub. L. O. II)... β (L. J. 27)... β (Doolittle
 (Pub. Flower Obs. 1)...Aitken ()...Hall (Wash.
 Obs. 1892)...Cint. (Cint. Glasenapp (1) L. J. 241
 ...Scott (Brit. Ast. Assn. v, 75; vi, 250)...]

 β 1274. B.A.C. 6216

R.A. 18^h 12^m 35^s *t*
 Decl. +56° 33' *v*

B and C

1892.37	147.1	0.88	9.8...	10.6	3 ^m β
1898.63	146.2	1.16	10.7...	11.6	4 ^m A

B and D

1878.85	5.0	5.03	11.0...	11.2	2 ^m β
1892.37	8.5	5.03	...	10.4	3 ^m β
1898.63	8.2	5.01	...	10.8	4 ^m A

A and B

1878.85	239.5	96.08	7.0...		2 ^m β
1892.35	239.1	95.01	6.4...		2 ^m β
1898.62	239.4	96.10	6.0...		3 ^m A

The wide double companion BD was noted with the 18½-inch in 1878, and the brighter of the two found to be a close pair with the 36-inch in 1892.

[β (XIX)... β (3141)... β (Pub. L. O. II)... β^1 ... β^3 ...Aitken (3885)...]

 β 48. Lalande 33720

R.A. 18^h 13^m 55^s *t*
 Decl. — 19° 43' *v*

1874.86	360.0	2.33	8.0...	10.0	3 ^m J
1877.58	358.7	2.17	8.0...	9.5	1 ^h Cin
1880.58	360.6	2.36	9.0...	9.5	1 ^h Cin
1886.30	358.8	2.51	9.0...	9.0	1 ^h LM
1892.56	360.2	2.17	8.2...	10.2	1 ^h Lv
1898.72	362.5	2.26	8.0...	10.7	3 ^m Ed

Discovered with the 6 inch. Without change.

[β III... β (Mon. Not. xxxv, 31)... β (1)...Cint. (Cint. L.M. Lv (A. J. 278) (Proc. Haverford Coll. Obs. 1892) ...Boothroyd ()...]

 β 1252. Lalande 33818

R.A. 18^h 15^m 55^s *t*
 Decl. — 11° 53' *v*

1876.70	182.4	1.21	8.0...	9.0	3 ^m J
1891.46	182.7	1.23	8.4...	9.1	3 ^m β
1898.49	181.3	1.29	8.4...	9.7	3 ^m D

Discovered with the 18½-inch June 22, 1875, but inadvertently omitted from my published catalogues of that time. There seems to have been no change.

[β (XVIII)... β (3113)... β (Pub. L. O. II)... β (1)... β (Doolittle (Pub. Flower Obs. 1)...]

 β 640. Herdendis 443

R.A. 18^h 16^m 3^s *t*
 Decl. — 27° 28' *v*

1878.91	346.2	2.37	7.5...	12.2	2 ^m β
1884.91	340.6	2.49	...		3 ^m HΣ
1892.38	341.1	2.20	8.0...	11.5	1 ^h β
1893.66	338.4	2.38	7...	11.3	1 ^h Ho

Discovered with the 18½-inch. Later measures are needed. Lalande 33880.

[β (X)... β^1 ... β^3 ... β (3142)... β (Pub. L. O. II)...Hough (3234)...HΣ ()...]

 β 641. Lalande 33897

R.A. 18^h 16^m 12^s *t*
 Decl. — 21° 27' *v*

1878.68	350.4	1.07	8.2...	9.0	1 ^h J
1885.12	349.2	1.00	7.1...	9.0	5 ^m β
1884.22	347.4	1.03	...		3 ^m HΣ
1886.29	348.0	1.10	7.3...	9.1	8 ^m En
1890.45	348.9	1.01	7.3...	9.0	3 ^m β
1890.71	357.4	1.02	...		2 ^m Maw
1891.01	351.6	0.87	...		4 ^m Sp
1891.79	355.9	0.94	...		1 ^h Maw
1892.81	357.5	0.92	7.5...	9.0	1 ^h HΣ
1894.77	355.0	...	...		1 ^h Cin
1894.77	353.4	...	...		1 ^h Cin
1896.03	359.5	1.31	...		1 ^h Cin
1896.62	349.5	0.92	...		4 ^m Luv
1897.53	349.5	1.04	...		2 ^m Luv
1897.70	347.8	0.97	...		3 ^m A

Discovered with the 18½-inch. Apparently there is change in angle.

Mon. Not. XXXIII, 351... *Mon. Not. XXXIII, 351*...
Mon. Not. XXXIII, 351... *Mon. Not. XXXIII, 351*...
Mon. Not. XXXIII, 351... *Mon. Not. XXXIII, 351*...

 β 40.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1877.66	47.2	7.86	8.0...	11.3	3 ^m	J
1880.52	50.1	7.86	8.0...	11.3	3 ^m	Cin
1892.55	40.0	8.31	8.3...	10.7	3 ^m	Lv
1895.47	45.5	8.31	7.5...	11.8	2 ^m	See
1898.47	40.5	8.10	8.0...	10.9	3 ^m	A
1898.50	39.9	8.08	8.4...	9.2	3 ^m	D

Discovered with the 6-inch. AITKEN measures from A two more distant stars:

(Mon. Not. XXXIII, 351)... *(Mon. Not. XXXIII, 351)*...
(Mon. Not. XXXIII, 351)... *(Mon. Not. XXXIII, 351)*...
 (3496)... Doolittle (*Pub. Flower Obs.*, 1)... Aitken

 β 1203.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1892.67	0.30	7.5...	7.7	2 ^m	β	
1892.40	66.8	0.32	7.0...	7.2	1 ^m	β
	48.0	0.43	7.0...	7.2	3 ^m	β
1896.74	72.6	0.43	7.0...	7.2	1 ^m	Lv
	72.0	0.31	7.0...	7.2	3 ^m	A

Discovered with the 36-inch. Lalande 34015.

Mon. Not. XXXIII, 351... *Mon. Not. XXXIII, 351*...

 β 965.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1877.17	111.3	8.1...	8.1	11.0	3 ^m	β
1891.17	111.3	8.1...	8.1	12.5	3 ^m	A
1891.17	111.3	8.3...	8.3	11.0	3 ^m	D

Discovered with the 18 $\frac{1}{2}$ -inch. Relatively fixed.

Mon. Not. XXXIII, 351... *Mon. Not. XXXIII, 351*...

 β 133.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1875.66	268.3	1.80	7.5...	7.5	4 ^m	Sp
1876.54	85.5	1.77	7.0...	7.5	1 ^m	Cin
1877.33	203.0	1.60	7.0...	7.0	1 ^m	Cin
1878.07	263.0	1.72	6.7...	6.7	3 ^m	Cin
1888.32	204.7	1.80	5.8...	6.2	2 ^m	Lv
1890.19	207.5	2.07	7.0...	7.1	2 ^m	Gl
1892.64	204.1	1.79	7.5...	7.5	2 ^m	T
1893.65	260.5	1.37	7.0...	7.0	2 ^m	Sel
1895.46	200.5	2.10	...	...	2 ^m	Bar
1897.50	259.3	1.75	7.1...	7.1	3 ^m	Sc
1897.68	258.7	1.74	7.5...	8.0	2 ^m	See

Discovered with the 6 inch. Very little, if any, change. The ρ star of a small equilateral triangle of 7^m stars, about 1' 20" S of A *Sagittarii*. GOULD gives this 6.8 m.

[β (111)... β (*Mon. Not. XXXIV, 59*)... Sp (111)... Sp (2133)...
 Cin³... Cin⁴... Cin⁵... Lv¹... Glasenapp (1)... Tarrant (3186)... Sellors (3240)... Barnard (*A. J.* 447)... See (3496)... Scott (*Mon. Not. LIX, 427*)...]

 β 264.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1874.72	360...	8.5...	1.2	1 ^m	β
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This was noted with the above description with the 9.4-inch of the Dartmouth College Observatory. I could not see this with the 12-inch in 1891, nor recently with the 40-inch. There is no doubt of the identity of the star. It is described in the original catalogue as 1^m 29' f Σ 2315. It was noted as "exceedingly faint" with the 9.4 inch, and it is possible that the companion has no real existence.

Mon. Not. XXXIV, 59...

 β 464.

R.A. 18^h 20^m 18^s 13.3
 Decl. - 20° 42' 13"

1877.17	111.3	1.20	8.5..	9.8	2 ^m	J
1891.17	111.2	1.15	8.6..	9.7	3 ^m	β
1898.51	108.4	1.12	8.9..	9.8	3 ^m	D

Discovered with the 6-inch. There is a third star 11 m, 90° 25'. In a low-power field with O Σ 350.

[β (III)... β (*Mon. Not. XXXIII*, 78)... β (3144)... β (*Pub. L. O. II*)... β (1)... β (Doddridge *Proc. Haverford Coll. Obs.*, 11...)]

β 134. O. Arz. N. 18233

R.A. 18^h 21^m 50^s ϵ
Decl. = 46° 49' N

1861.32	138.9	1.24	7.2...	9.2	29	O Σ
1875.18	133.7	1.07	7.0...	9.8	49	J
1879.47	136.1	0.95	8.0...	10.0	19	β
1896.52	137.3	1.15	7.7...	9.7	39	Lv
1896.74	127.4	1.08	...	...	19	Lew
1898.62	135.3	1.04	...	...	29	Bow
1898.64	138.4	1.13	...	...	29	Bry

Discovered with the 6-inch, but it had been seen before at Poulkowa, and is O Σ 543, one of the subsequently published additions to the Poulkowa Catalogue (*Poulkowa Observations*, Vol. IX). There is no change in the components.

[β (III)... β (*Mon. Not. XXXIV*, 59)... β (102)... β (*Poulkowa Obs.*, IX)... β (1)... β (A. J. 407)...Lewis, Bowyer and Bryant (*Mon. Not. LXV*, 418)...]

β 1128. B.A.C. 6285

R.A. 18^h 23^m 12^s ϵ
Decl. = 33° 4' N

1877.53	204.8	2.41	6.0...	12.0	19	Cin
1889.42	198.6	3.17	6.1...	11.8	39	β
1892.56	201.0	...	6.0	11.9	19	Lv

When this pair was found with the 12-inch, its identity with one of HOWE's, discovered in 1877 at Cincinnati, was overlooked. The *Cape Catalogue* gives the principal star a proper motion of 0.07 in the direction of 180°. If this is correct, and the small star is fixed in space, its distance from the primary should decrease annually by nearly this amount.

[Cin?... β (XXX)... β (1895)... β (*Proc. L. O. II*)...Howe (Cin)...Lv (*Proc. Haverford Coll. Obs.*, 1892)...]

β 966. B.A.C. 6394

R.A. 18^h 25^m 25^s ϵ
Decl. = 19° 33' N

B and C

1880.61	120.2	0.62	9.0...	9.8	39	β
1898.68	120.6	0.70	8.0...	9.5	19	A
1898.75	120.5	0.72	9.8...	10.2	49	Cg

A and BC

1880.58	252.8	66.34	6.7...	...	39	β
1898.68	252.9	66.82	6.6...	...	19	A
1898.75	252.7	66.62	7.0...	...	39	Cg

Discovered with the 18½-inch. This is the principal star in the cluster, MESSIER 25. In HEIS 6-7 m; GOULD, 7¼; B.A.C. 7. There is a wide pair of small stars in the field $\alpha\beta$ measured in Cin²; 17.3, 0° 10.69; 8.0, 0° 8.5 (1879.39) 19. GRAY-NAPP measures a very distant 7.4 m star from A, 254° 2' 430.66 (1893.66) 29.

[β (XIII)... β (196, 209)...Atken (1885)...Gogshall (1901)...]

β 247. Lalande 34253

R.A. 18^h 25^m 36^s ϵ
Decl. = 9° 27' N

1875.43	167.4	7.62	7.8...	11.2	39	J
1878.54	166.9	7.70	8.0...	11.5	19	Cin
1880.59	169.0	7.42	7.0...	10.0	19	Cin
1888.56	167.9	7.99	6.5...	10.8	29	Lv
1891.66	166.8	7.69	...	...	29	Col

Discovered with the 6-inch. Without change.

[β (V)... β (*Mon. Not. XXXV*, 31)...J (1)...Cin²...Lv...Collins (*Proc. Haverford Coll. Obs.*, 1891)...]

β 410. Lalande 34254

R.A. 18^h 25^m 32^s ϵ
Decl. = 7° 58' N

1877.03	57.0	1.22	8.5...	9.2	39	J
1888.52	56.6	1.32	8.0...	...	29	Lv
1898.51	46.9	1.54	7.6...	...	39	D

Discovered with the 6-inch. Change?

[β (II)... β (1893)... β (1)...Lv... β (1893)... β (1893)... β (1893)...]

β 428. *Procyon* 428

$\alpha = 07^h 09^m 41^s$
 $\delta = +05^\circ 13' 30''$

$\lambda = 100.0$
 $b = 0.0$

1864.1	1897.0	1.45	0.7...	1.0	40	β
1864.4	1899.4	1.52	8.8	106.2	20	β
1893.44	276.6	1.80	3.8	13.7	20	W

$\lambda = 100.0$
 $b = 0.0$

1864.4	1899.4	1.52	8.8	106.2	20	β
1893.44	276.6	1.80	3.8	13.7	20	W

Discovered with the 6-inch.

[β (511)... β (2103)... β^1 ... β (1)...Wilson ()...]

 β 642. *8.15* (107) 642

$\alpha = 06^h 31^m 18^s$
 $\delta = +07^\circ 12' 30''$

$\lambda = 100.0$
 $b = 0.0$

1891.1	91.1	8.15	8.0	11.0	10	β
1891.62	91.4	4.14	8.9	10.9	30	β

Discovered with the 18 $\frac{1}{2}$ -inch. One of the principal stars in the cluster, DREYER 6649.

[β (5)... β^1 ... β (3114)... β (*Pub. L. O. II*)...]

 β 1253. *Lyræ 28*

$\alpha = 08^h 08^m 15^s$
 $\delta = +08^\circ 30' 45''$

1891.2	90.1	7.44	6.2...	13.5	10	β
1891.7	10.1	7.31	6.0...	13.2	10	A

Discovered with the 36-inch. This is the naked-eye star in *Lyræ*; HEIS 6.5 m; Harvard 5.7. Lalande 34418. KOENIG gives this star a proper motion of 0.015 in the direction of 350° 2.

[β (3113)... β (*Pub. L. O. II*)...Aitken (3585)...]

 β 644. *Lalande 34418*

$\alpha = 08^h 08^m 15^s$
 $\delta = +08^\circ 30' 45''$

$\lambda = 100.0$
 $b = 0.0$

1891.1	91.1	8.15	8.0	11.0	10	β
1891.62	91.4	4.14	8.9	10.9	30	β
1891.7	10.1	7.31	6.0...	13.2	10	A
1891.7	10.1	7.31	6.0...	13.2	10	A

λ and b Σ 2312)

1831.71	11.9	26.91	5.7...	8.8	40	Σ
1895.58	9.3	28.07	6.8...	8.9	50	J
1877.63	6.2	28.88	...	...	70	Jed
1891.67	7.3	29.12	...	8.7	30	β
1898.49	7.1	29.35	6.5...	8.0	10	D
1898.53	7.0	29.28	6.0...	8.2	30	A

The nearest companion was detected with the 18 $\frac{1}{2}$ -inch. The change in SKRIVE's star is evidently due to the proper motion of A. The measures of AC in 1830 and 1898 give this as 0.05 in the direction of 144°, and this movement accounts for the change in AB. There was a time when these two stars were separated by a distance of about 2".

[β (5)... β (3114)... β (*Pub. L. O. II*)... β (446, 3...*A. P.* XIII, 16)...Doolittle (*Pub. Flower Obs.* 1)...Aitken (3585)...]

There are many measures of the wide pair, of which enough are given to show the character and extent of the relative motion. All the measures will be found in the following:

[Measures: *Lalande System* 1) (*Procyon Obs.* XI, XII, XV)...Herschel (*Mem. R. A. S.* VI, XXXVIII)...*d* (1573)...*d* (11)...Jedrejewicz (2369)...Gledhill, Wilson and Sealroke (*Mem. R. A. S.* XLII, XLVIII)...Glaspenn (111)...]

 β 435. *Lalande 34476*

$\alpha = 18^h 10^m 16^s$
 $\delta = +14^\circ 06' 30''$

1875.08	184.0	2.15	6.7...	11.5	40	J
1878.49	186.6	...	6.7...	11.5	10	Cin
1879.59	183.9	2.27	7.0...	12.0	10	β
1882.47	187.3	2.49	7.0...	11.0	10	W
1886.44	185.8	...	7.5...	12.5	10	LM
1892.52	187.1	...	8.0...	12.0	10	Lv
1893.54	187.6	2.24	7.0...	12.5	20	Lv
1893.67	188.8	2.26	7.0...	12.0	20	W

Discovered with the 6-inch. Very difficult with that aperture. Probably without material change. The distance in my single measure in 1879 is erroneously reduced in β^1 . It should be as given above.

[β (111)... β (*Mon. Not.* XXXIV, 59)... β^1 ...*d* (1)...Cin5...Wilson (Cin5)...LM...Lv (*A. J.* 278, 382) (*Proc. Harv. Observ.* 1890, 1891)...Aitken (3585)...]

β 967. S.D. 011.0 8352R.A. 18^h 46^m 2.7
Decl. - 14° 30' V

1880.54	195.8	2.44	8.0...	11.1	19	β
1888.45	196.9	...	8.0...	11.2	19	Lv
1893.54	194.1	2.33	7.8...	11.8	39	Lv
1893.60	200.2	2.25	8.5...	11.0	19	W
1898.50	194.4	2.21	7.9...	12.3	39	D
1898.73	198.3	2.43	8.2...	12.5	39	W

Discovered with the 18½ inch. Probably unchanged. The magnitude in S.D. is 8.3.

[β (xii)... β ...Lv...Lv (A. J. 382)...Wilson ()...
Doolittle (Pub. Flower Obs. 1)...Boothroyd ()...]

 β 50. D.M. 36.1 3475R.A. 18^h 36^m 2.7
Decl. - 37° 29' V

A and B

1892.38	6.9	21.06	8.5...	11.3	19	β
1899.42	8.7	21.36	9.5...	12.5	19	β

A and C

1892.38	336.0	73.06	...	...	19	β
1899.42	320.9	73.52	...	...	19	β

C and D

1892.38	197.2	5.82	9.5...	11.1	19	β
1899.42	168.0	6.44	12...	11.1	19	β

Distant double companion noted with the 6-inch. Of no special interest as a double star.

[β (i)... β (Mon. Not. xxxiii, 351)... β (3142)... β (Pub. L. O. iii)...]

 β 136. W. XVIII. 803R.A. 18^h 37^m 2.7
Decl. - 5° 37' S

1874.84	8.0	4.80	9.2...	9.7	39	J
1892.54	7.7	4.68	9.0...	9.2	29	Lv
1899.44	6.8	4.60	8.7...	9.0	39	β

Faint pair noted with the 6-inch. In D.M. 8.6m. It is μ β and 6.57 (1923).

[β (iii)... β (Mon. Not. xxxiii, 351)... β (3142)... β (Pub. L. O. iii)...
Doolittle (Pub. Flower Obs. 1)...Boothroyd ()...]

 β 645. Her. 175R.A. 18^h 38^m 2.7
Decl. - 14° 30' V

1877.52	314.2	9.9	7.0...	12.0	19	β
1877.74	307.3	9.22	7.0...	12.0	19	β
1883.57	305.0	9.22	7.0...	12.0	29	II Σ
1896.58	303.6	9.53	7.3...	13.0	39	Lv
1898.69	304.9	9.92	7.7...	11.7	39	D

Discovered with the 18½-inch. In my single measure the distance was noted as uncertain, and I found it very difficult. On the whole there is no evidence of change. Lalande 34772.

[β (ix)... β (211)...Lv...Lv (A. J. 382)...Wilson ()...
Doolittle (Pub. Flower Obs. 1)...Boothroyd ()...]

 β 1254. W. XVIII. 1135R.A. 18^h 38^m 2.7
Decl. - 14° 30' V

1875	8.1	2.5	8.2...	12	29	β
1889.67	74.5	2.43	8.0...	12.0	29	Ho
1891.52	78.2	2.17	8.2...	11.0	39	β
1897.58	73.7	2.35	8.0...	11.0	39	A

Discovered with the 18½-inch in 1875, but inadvertently omitted from the catalogues of new pairs of that time. It was found independently and subsequently published by Hough (= Ho 438).

[β (ix)... β (211)...Lv...Lv (A. J. 382)...Wilson ()...
Doolittle (Pub. Flower Obs. 1)...Boothroyd ()...]

 β 008. ξ ZircR.A. 18^h 37^m 2.7
Decl. - 5° 37' S

A and B

1881.43	18.2	26.03	13.7	29	J
1898.93	50.7	27.04	14.7	39	A

A and C

1881.43	275.4	13.37	13.7	29	β
1898.93	275.4	45.55	14.7	39	A

1878.47	312.5	3.60	6.0...	9.5	20	β
1879.47	298.3	0.06	6.5...	9.2	17	β
1883.64	278.4	1.00			25	H2
1885.61	288.9	1.10			19	H2
1889.87	247.4	1.1			15	γ
1890.33	247.7	1.26	6.0...	10.2	35	β
1890.33	247.9	1.1	6.0...	9.3	34	β
1891.84	244.4	1.37			19	H2
1892.38	245.6	1.20	6.0...	9.2	50	β
1892.70	242.3	1.24			49	Sp
1893.43	240.3	1.26	6.0...	8.8	29	W
1893.49	240.2	1.4	6.0...	8.8	29	W
1893.77	241.8	1.12			19	Sp
1894.78	237.9	1.27			49	Sp
1895.90	237.9	1.19	6.0...	8.8	35	W
1896.45	238.7	1.02			35	β
1896.47	225.1	1.33			19	Dy
1896.49	237.5	1.34			35	W
1896.57	233.4	1.15	6.0...	8.8	4	β
1896.62	233.2	1.17			49	W
1896.77	232.9	1.3			35	Sp
1897.44	229.1	1.39			19	H2
1897.54	230.2	1.14			49	W
1897.70	229.8	1.33			35	W
1897.74	230.3	1.1			25	Br

1874	1.3	1.2	3	A
1875	1.6	1.1	4	Low
1876	1.9	1.0	5	Bis
1877	2.2	0.9	6	B
1878	2.5	0.8	7	B
1879	2.8	0.7	8	A

red with the 18½-inch. At that time it was a very difficult object, but in recent years the distance has considerably increased, and it has been measurable with moderate apertures. It was certain at the beginning that this was a binary system, since the two stars must have the same proper motion, as otherwise it would have been recorded as a double star long before. The principal star has an annual proper motion of 0".231 in the direction of 134.8 (PORTER). The maximum distance of the companion appears to have been reached, and the change in angle is now slow. It will be impossible to form any idea of the apparent orbit for some time to come, but there can be no doubt that this will be a most interesting physical system for investigation in the future. This is a naked-eye star near γ Lyrae.



Fig. 1. — Relative positions of β 640, 1874-1879. (From the observations of J. H. P. Oort, 1874-1879. — *Astronomische Nachrichten*, 1880, 31, 112.)

β 640. D.M. (3.5) 3285

R.A. 18h 34m 23.1 s
Dec. 1 32 18.5

1875.36	12.8	1.57	8.5	11.7	29	β
1877.57	7.8	1.59	8.2	11.6	30	β
1880.15	7.9	1.44			29	Low
1898.73	2.8	1.76			19	Bis

Discovered with the 18½-inch. This pair is 13' out of γ Lyrae.

[R.A. 18h 34m 23.1 s, Dec. 1 32 18.5. — Lewis and Boyer, 1875, Vol. 1, No. 1.]

β 973. D.M. (8") 5915

R.A. 18h 33m 48.1 s
Dec. 1 38 45.5

A and B

1875.13	35.7	1.43	9.1	11.0	59	β
1890.61	35.6	1.00	9.0	11.6	39	β
1898.73	35.1	1.72	8.3	11.5	39	Bid

C and D (Howe)

1879.31	24.3		11.0	11.0	19	Cin
1880.13	262.7	2.00	11.4	11.0	59	β
1890.61	260.1	3.24	11.0	11.2	39	β
1898.73	261.2	3.77	11.8	12.1	39	Bid

A and C

1880.28	20.7	10.73			39	β
1890.61	19.8	11.0			39	β
1898.73	20.7	11.10			39	Bid

A and D (Σ 2435)

1827.67	12.3	10.25	8.5	11.5	29	Σ
1847.66	12.3				19	Ma
1876.58	8.5	10.38			19	O Σ
1879.31	12.6	9.23			19	Cin
1880.16	8.9	9.84			39	β
1890.60	12.2	10.16			29	β
1898.73	4.2	10.07			39	Bid

The smaller component of Σ 2435 was discovered to be double by Howe at Cambridge. In measuring this with the 18½-inch I found that the principal star was also double. There are but few measures of the STRIVE pair. In 1864 DEMBOWSKI was unable to see the companion. In 1873

I examined it with the 6-inch, and saw it without difficulty, and noted it as "certainly much brighter than 11.5 m." It was called "extremely difficult" by O Σ in 1876.

So far there is no evidence of relative motion in either of the new pairs. All the measures of AD are given above.

[β (XIII)... β 5048... β *Fixt.* *L. O. 111*... β *Fixt.* *Dec.* XIX, 126)...Cin δ ...Boothroyd ()...Madler (*Fixt.* *Syst.* II)...Herschel (*Mem.* R. A. S. XXXVIII)... δ (1736)...O Σ (*Poulkova Obs.* X)...]

 β 974. Schj. 7133

R.A. 18^h 58^m 53^s 9
Decl. + 6^o 21' 3"

1886.60	87.8	0.72	9.4	9.8	3 ^m	β
1891.40	84.4	0.06	9.0	9.2	2 ^m	β
1898.60	87.5	0.01	8.2	9.8	3 ^m	Bd

Discovered with the 18 $\frac{1}{2}$ -inch. There is a 12 m star about 25" distant in 100.

[β (XIII)... β 3114)... β (*Pub.* *L. O. 111*)...Boothroyd ()...]

 β 52. W Σ XVIII, 1894

R.A. 18^h 58^m 54^s 9
Decl. + 25^o 51' 3"

B and C

1896.61	171.0	8.65	9.6	11.5	3 ^m	Lv
1898.73	171.5	8.90	10.3	11.2	5 ^m	D

A and B

1896.61	299.8	51.91	8.2		3 ^m	Lv
1898.73	299.8	51.66	8.6		5 ^m	D

Discovered with the 6-inch. The distances are too great to make it an object of any interest. In the field with Σ 2444.

[β (I)... β (*Mon. Not.* XXXIII, 351)...Lv (*A. J.* 407)...Doolittle (*Pub. Flower Obs.* I)...]

 β 1285. Lalande 35740

R.A. 18^h 57^m 31^s 9
Decl. + 33^o 48' 3"

A and B

1899.31	295.1	11.10	7.1	13.3	3 ^m	β
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A and C

1899.44	298.4	59.84		15.5	1 ^m	β
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In my Mt. Hamilton observing book of May 27, 1892, I find this star noted with the 36-inch, "possibly a close pair. There is a faint star 10" or 12" ρ ." I have looked at this a number of times with the 40-inch, and measured the distant companions as given above, but cannot say whether or not the large star is a close pair. Further observations with a large aperture are necessary to settle this point. AITKEN found the principal star single 1899.44 with the 36-inch on a good night with power of 1000.

 β 466. W Σ XVIII, 1593

R.A. 18^h 59^m 54^s 9
Decl. + 10^o 54' 3"

1877.73	165.1	1.71	9.2	10.0	2 ^m	J
1891.77	165.9	1.84	8.5	9.9	2 ^m	β

Discovered with the 6-inch.

[β (I)... β (*Mon. Not.* XXXVIII, 78)... β (XIII)... β (*Pub.* *L. O. 111*)... β (*Pub.* *L. O. 111*)...]

 β 287. ζ Aquilae

R.A. 18^h 59^m 54^s 9
Decl. + 13^o 41' 3"

1874.60	58.9	5.53	3	12	1 ^m	New
1878.54	59.6	4.92		12	3 ^m	β
1878.90	59.7	5.95	3.2	12	3 ^m	O Σ
1879.08	61.1	5.55	3	13	3 ^m	HI
1879.53	60.1	4.74		13	1 ^m	β
1885.68	62.4	5.64			2 ^m	HI
1886.89	59.5	5.75			8 ^m	II Σ
1889.43	57.3	5.03		13	3 ^m	β
1894.38	57.0	6.18			1 ^m	Bar
1896.64	56.8	5.87			1 ^m	Lv
1898.61	59.0	5.98		13.2	3 ^m	D

Discovered with the 26 inch at the Naval Observatory. AUWERS gives the proper motion of ζ Aquilae, 1890-1907 in the direction of 203.3 11 the small star was stationary, in twenty years its position-angle would diminish 10", and the distance increase 1.7 by virtue of the proper motion of A.

0°54 in the direction of 36°2. If that is substantially correct, this is a physical system. If either component was fixed, this movement of the other star would change the position-angle in the above interval not less than 80°. The magnitude in D.M. is 7.1.

[β (XVI)... β (2956)... β (Pub. L. C. 11)... Arden (3388)...

β 423. O. Arg. S. 19590

R.A. 19^h 26^m 18^s \pm
Decl. - 29° 44' \pm

1878.63	122.3	1.25	7.5...	8.5	2 ^m	Cin
1886.78	124.3	1.27	...	...	1 ^m	LM
1893.68	125.4	1.09	9	10	2 ^m	Sel
1897.70	124.9	1.31	7.1...	8.6	1 ^m	See
1898.63	126.5	1.26	8.7...	9.2	3 ^m	D

Discovered with the 6-inch. Apparently without material change.

[β (VII)... β (2103)...Cin⁴...Cin⁶...LM...Sellers (3240)... See (3496)...Doolittle (Pub. Flower Obs. 1)...]

β 142. (=Schj. 28). *Aquila* 106

R.A. 19^h 21^m 36^s \pm
Decl. - 12° 23' \pm

1874.08	317.7	1.37	7.9...	8.2	5 ^m	J
1878.89	319.6	1.37	7.8...	8.0	3 ^m	Cin
1879.16	319.5	1.58	8.0...	8.2	4 ^m	Sp
1882.54	324.3	1.68	7.7...	8.0	4 ^m	W
1883.62	325.8	1.10	7.0...	7.2	3 ^m	Ho
1886.54	327.6	1.68	8.0...	8.2	1 ^m	LM
1888.54	328.3	1.60	7.8...	7.9	3 ^m	Lv
1888.70	326.3	1.47	7.7...	8.0	3 ^m	T
1893.49	330.8	1.53	7.4...	7.9	3 ^m	Lv
1896.50	333.8	1.56	7.7...	8.0	2 ^m	Lv
1896.51	334.4	1.62	7.5...	7.6	2 ^m	See
1897.69	332.7	1.53	...	...	4 ^m	Scott
1898.65	333.5	1.55	...	...	2 ^m	Scott

Found with the 6-inch, and given in β (111) before I was aware of the fact that it had been discovered and published long before by SCHJELLERUP. It is given here in order to say that hereafter it should be referred to as Schj. 28, which is the number in his list of new pairs in A.N. 1485. There has been some confusion in regard to his numbers from the fact of two lists having been printed

which are not identical. The other list is unnumbered, and is found in the introduction to his *Catalogue of 10,000 Stars*. Each list contains some stars not found in the other, but all the doubles of any consequence are given in A.N., and as those stars have a current number, that list was probably intended by the author to be used for future reference. Two of the pairs given in the catalogue and repeated in the A.N. list are identical with double stars in HERSCHEL and STRUVE, and it was doubtless the purpose to exclude all previously known pairs, but that has not been entirely done. No. 1 is H 658; No. 5 is Σ 1077; and Nos. 15 to 18 inclusive are respectively Σ 3090, Σ 3094, Σ 3096, and Σ 3101.

The measures of the pair given above show slow, direct angular movement. This star is Lalande 36712.

[β (III)... β (Mon. Yrb. XXXV, 41... 2...), Cin... Sp...], ...Wilson (Cin¹⁰)...Hough (2978)...LM...Lv...Lv...
ONE, *Mon. Yrb.*, 77 (Oct. 1, 1824, 1871)...
Some *A. L.* 110). Some *Mon. Yrb.*, 1827, 1871.

β 1286. W. XIX 62

R.A. 19^h 29^m 39^s \pm
Decl. - 45° 24' \pm

B and C

1899.48	67.4	1.59	9.3...	12.5	3 ^m	β
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A and B

1899.48	118.5	5.00	8.0...	...	3 ^m	β
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Discovered with the 40-inch in looking for the next pair (β 424), which is closely *af*. This star is noted "duplex 10" in WEISSE. As the distance is now less than 6", there may be some change from proper motion or otherwise.

β 424. W. XIX 67

R.A. 19^h 28^m 8^s \pm
Decl. - 45° 45' \pm

1877.14	18	2.76	8.7...	10.1	4 ^m	β
1881.72	40.1	2.00	8.7	10.1	2 ^m	β
1890.44	39.5	2.67	8.0	11	2 ^m	β

Discovered with the 40-inch. Without change.
[β (III)... β (1214)... β (2956)... β (111)...]

β 654. Lalande 37072 (1806)

R.A. 10^h 39^m 27^s.
Decl. $-28^{\circ} 15' 35''$

1898.46	104.6	2.00	7.5	10.8	4 ^m	β
1898.52	104.5	2.24	7.4	10.4	3 ^m	β

Discovered with the 18½-inch. ...
... 1898.52

... 1898.52 ... 1898.52 ... 1898.52

 β 650. Lalande 36128

R.A. 10^h 39^m 27^s.
Decl. $-28^{\circ} 15' 35''$

A and B

1898.46	144.6	7.4	8.5	11.5	1 ^m	β
1898.52	144.7	7.41	8.1	11.6	2 ^m	β
1898.52	145.4	6.43	8.7	11.4	3 ^m	D

A and C

1898.46	144.6	7.4	8.5	11.5	1 ^m	β
1898.52	144.7	7.41	8.1	11.6	2 ^m	β
1898.52	145.4	6.43	8.7	11.4	3 ^m	D

A and D

1898.46	144.6	7.4	8.5	11.5	1 ^m	β
1898.52	144.7	7.41	8.1	11.6	2 ^m	β
1898.52	145.4	6.43	8.7	11.4	3 ^m	D

Discovered with the 18½-inch. In the first instance the principal star was erroneously identified with Lalande 36918. The correct place is given above.

... 1898.52 ... 1898.52 ... 1898.52

 β 976. Lalande 36822

R.A. 10^h 39^m 27^s.
Decl. $-28^{\circ} 15' 35''$

1898.50	105.0	2.01	7.0	10.8	4 ^m	β
1898.52	104.8	2.10	7.0	10.8	3 ^m	β
1898.42	104.3	2.16	7.2	10.7	3 ^m	β

Discovered with the 18½-inch. Lalande 36963.

... 1898.52 ... 1898.52 ... 1898.52

 β 143. Lalande 37040

R.A. 10^h 39^m 27^s.
Decl. $-28^{\circ} 15' 35''$

1875.61	102.7	2.20	8.0	9.1	1 ^m	J
1898.51	102.9	2.15	7.8	8.7	3 ^m	Lv
1898.45	102.2	2.21	9.0	9.6	3 ^m	D

Discovered with the 6-inch. Probably fixed.

... 1898.52 ... 1898.52 ... 1898.52

 β 438. D.M. 130° 3588

R.A. 10^h 39^m 27^s.
Decl. $-28^{\circ} 15' 35''$

A and B

1879.46	40.9	4.37	...	13	1 ^m	β
1898.53	40.5	4.05	7.9	12.7	2 ^m	β

A and C

1878.47	238.5	24.00	...	13	1 ^m	β
1891.52	236.7	21.52	...	12.8	2 ^m	β

A and D (Σ 2538)

1830.85	214.2	53.04	8.2	8.3	2 ^m	Σ
1890.38	247.4	52.86	8.1	8.4	3 ^m	J
1886.57	246.1	52.04	7.9	8.3	3 ^m	Per
1891.53	246.0	53.04	...	...	2 ^m	β

D and E

1830.87	52.5	6.68	8.7	3 ^m	Σ
1866.35	53.3	6.68	8.6	3 ^m	J
1886.57	51.3	6.05	8.5	3 ^m	Per
1891.51	53.8	6.66	8.6	2 ^m	β

A and E

1862.64	217.1	46.81	...	1 ^m	J
1883.70	246.8	47.13	...	1 ^m	En
1890.51	247.9	46.94	...	2 ^m	β

The faint attendant to the principal star of the triple, Σ 2538 (= S 710), and the little star between the two pairs were discovered with the 18½-inch. There is no change in the relation of the original components. A few only of the measures are given to show their relative fixity.

... 1898.52 ... 1898.52 ... 1898.52

The following include all the observations of the old stars:

[Herschel (*Mem. R. A. S.* IV, 31)...Madler (*Dorpat Obs.* XI) (*Fixstern-Systeme* I)...O Σ (*Poulkova Obs.* IX; X, pp. 42, 183)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII, XLVIII)...Secchi (*Cat. 1321 Stars*)...Perrotin (*Annals Nice Obs.* II)... Δ (II)...Engelmann (2677)...Glasenapp (III)...]

β 652. Piazzix XIX. 169

R.A. 19^h 27^m 16^s .1
Decl. + 28° 1' .5

A and B

1878.97	328.6	4.33	... 13.0	2 ⁿ	β
1884.24	325.3	5.29	...	3 ⁿ	11 Σ
1892.38	325.3	5.17	... 13.3	3 ⁿ	β

A and C (= Σ 2539)

1830.69	5.2	5.36	7.9...	9.7	4 ⁿ	Σ
1867.03	2.4	5.38	7.5...	9.3	3 ⁿ	J
1887.73	3.8	5.60	8.0...	9.0	4 ⁿ	β
1887.78	2.8	5.34	7.5...	9.3	4 ⁿ	T
1892.38	3.5	5.40	8.0...	8.7	3 ⁿ	β

The faint companion to the principal star of Σ 2539 (= H⁺ II. 99 = S 718) was discovered with the 18½-inch. There is no change in AC since the first measures of STRUVE.

[β (X)... β ... β ... β (A. J. 268)... β (SL42)... β (*Pach. L. O.* II)...H Σ (...)]

A few of the measures of Σ 2539 are given above. All will be found in the original double-star catalogue referred to, and in the following:

[Madler (*Fixstern-Systeme* II) (*Dorpat Obs.* XI, XIII)...Secchi (*Catálogo di 1321 Stelle Doppie*)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII)... Δ (II)...Tarrant (2898)...Lewis, etc. (*Mon. Not.* LIX, 421)...]

β 653. μ Aquilae

R.A. 19^h 28^m 14^s .1
Decl. + 7° 58' .5

A and B

1878.07	274.9	21.42	4.5...	13	1 ⁿ	β
1891.43	276.6	24.08	...	...	2 ⁿ	β
1896.49	278.2	26.56	4.5...	13	2 ⁿ	1A
1898.57	278.3	27.29	5...	...	3 ⁿ	A

A and C

1878.62	283.7	21.18	...	13	2 ⁿ	β
1891.43	288.4	25.12	...	...	2 ⁿ	β
1896.49	289.0	26.58	...	13	2 ⁿ	1A
1898.57	288.9	27.13	...	...	3 ⁿ	A

B and C

1877.51	194.4	5.2...	...	...	1 ⁿ	β
1891.43	195.7	5.60	12.2...	12.3	2 ⁿ	β
1898.57	196.4	5.22	11.3...	11.8	3 ⁿ	A

These faint companions were discovered with the 18½-inch. The change in the distance from the primary is the result of the proper motion of A, which is given, 0".233 in the direction of 124.7° (AUWERS). There seems to be no relative change in BC. ENGELHARDT (*Obs.* Astron. II, III) has measured two distant stars:

1887.65	349.7	59.60	...	12.5	1 ⁿ	Eng
1896.55	347.5	60.04	...	...	1 ⁿ	β

1887.65	71.9	183.06	...	9.6	2 ⁿ	Eng
1891.71	71.3	182.15	...	...	2 ⁿ	Eng
1899.55	70.9	180.78	...	...	1 ⁿ	β

[β (X)... β ... β (SL44)... β (*Pach. L. O.* II)... β (A. J. 470)...Aitken (3585)...]

β 1130. γ Vulpeculae

R.A. 19^h 29^m 19^s .1
Decl. + 13° 31' .5

1889.43	31.3	0.53	5.5...	11.8	3 ⁿ	β
1898.57	31.7	9.19	...	13.3	3 ⁿ	β
1898.77	33.2	9.30	5...	11.2	3 ⁿ	A

The faint companion was discovered with the 36-inch. AUWERS gives the proper motion of A, 0".027 in the direction of 313.8°. The interval between the measures is too short to say whether or not the companion is moving with it.

[β (XIII)... β (2850)... β (*Pach. L. O.* II)...Aitken (3585)...]

β 654. δ Sagittarii

R.A. 19^h 29^m 21^s .1
Decl. + 28° 31' .5

1878.57	166.8	2.03	5.7...	11.8	3 ⁿ	β
1878.72	163.2	2.04	4.4...	9.7	2 ⁿ	C III
1886.12	150.1	3...	5.1...	11.5	4 ⁿ	β

1878.43 1884.1 10.1 11.5 3.0 See
1878.43 1884.1 10.1 11.5 3.0

Discovered with the 18½-inch. The large star has a proper motion of 0.024 in the direction of 114.3 (AUWERS). Further measures are necessary to show whether this belongs to both components.

[Mayer, *Verhandl. d. Astr. Ges. Bonn* (1877), 1878.43 1884.1 10.1 11.5 3.0
(*Publ. L. O. N.*)... Aitken (3585)...]

β 53. D.M. 111 (1878)

R.A. 19^h 40^m 48^s 1
Decl. + 31° 38' 3"

1878.47	246.8	4.2	9.5	10.2	3 ⁿ J
1878.47	249.6	4.13	8.8	9.7	3 ⁿ β

Discovered with the 6-inch.

[Mayer, *Verhandl. d. Astr. Ges. Bonn* (1877), 1878.47 246.8 4.2 9.5 10.2 3ⁿ J
(*Publ. L. O. N.*)... Aitken (3585)...]

β 655. D.M. 111 (1878)

R.A. 19^h 40^m 48^s 1
Decl. + 31° 38' 3"

C and D

1878.48	152.6	1.13	12.5	10	β
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A and B (= 2 + 3 + 4)

1878.48	207.1	2.13	7.7...	8.9	3 ⁿ Σ
1878.48	207.8	2.13	7.7...	8.8	1 ⁿ M ₃
1878.48	289.6	22.32	7.1...	8.8	4 ⁿ J
1878.48	289.4	22.86	7.1...	8.8	1 ⁿ β
1878.48	288.6	22.75	6.7...	7.5	4 ⁿ I
1878.48	288.3	22.75	7.7...	8.9	3 ⁿ G
1878.48	288.6	22.75	8.0...	8.9	3 ⁿ I
1878.48	288.2	24.00	8.2	2 ⁿ A	
1878.48	288.6	24.02	8.2	2 ⁿ β	

[Mayer, *Verhandl. d. Astr. Ges. Bonn* (1877), 1878.48 207.1 2.13 7.7 8.9 3ⁿ Σ
(*Publ. L. O. N.*)... Aitken (3585)...]

1878.48	275.8	3.13	7.7	3 ⁿ Σ	
1878.48	277.2	45.98	7.1...	7.3	4 ⁿ J
1878.48	276.7	46.79	7.1...	7.3	3 ⁿ β
1878.48	276.1	46.13	6.8...	6.6	3 ⁿ F
1878.48	275.8	46.00	7.7...	7.3	3 ⁿ I
1878.48	275.2	50.62	8.2	3 ⁿ I	
1878.48	275.2	50.61	7	3 ⁿ A	
1878.48	275.8	50.22	7	3 ⁿ β	

C and B

1878.48	89.0	26.88	...	4 ⁿ Σ
1878.48	87.1	27.13	...	4 ⁿ J
1878.48	84.9	27.03	...	1 ⁿ β
1878.48	84.9	27.03	...	2 ⁿ G
1878.48	84.9	27.80	...	2 ⁿ A

The preceding star of the wide triple was found to be double with the 18½-inch. There has been some change in the components of Σ 2549, probably from proper motion. At least two of the three principal stars have some movement, as the distance of CB is evidently increasing. A, B, and C are respectively Nos. 10572, 10571, and 10570 of *Krueger's A. G. Catalogue*.

[Mayer, *Verhandl. d. Astr. Ges. Bonn* (1877), 1878.48 89.0 26.88 27.13 27.03 27.80 4ⁿ Σ
(*Publ. L. O. N.*)... Aitken (3585)...]

The complete measures of the wide stars are given. The observations will be found as follows:

[Mayer, *Verhandl. d. Astr. Ges. Bonn* (1877), 1878.48 89.0 26.88 27.13 27.03 27.80 4ⁿ Σ
(*Publ. L. O. N.*)... Aitken (3585)...]

β 1257. Lacaille 37450

R.A. 19^h 30^m 27^s 1
Decl. + 10° 50' 1"

1878.72	175.5	3.12	6.8...	13.2	3 ⁿ β
1878.74	178.6	4.08	7.0...	13.2	2 ⁿ A

Discovered with the 36-inch. In D.M. 6.8 m.

[β (xviii)...β (3113)...β (*Publ. L. O. N.*)... Aitken (3585)...]

β 761. Lacaille 8174

R.A. 17^h 45^m 45^s 1
Decl. — 30° 42' 1"

1879.68	197.4	2.12	8.0...	10.5	3 ⁿ β
1886.71	198.7	2.55	7	11	1 ⁿ Pol
1886.72	198.2	2.45	7.7...	10.2	3 ⁿ β
1896.63	196.0	2.33	...	...	3 ⁿ See

Discovered with the 6-inch on Mt. Hamilton in 1879. The measures show no motion.

[β (xviii)...β (3113)...β (*Publ. L. O. N.*)... Aitken (3585)...]

β 249. Lalande 37227R.A. 16^h 32^m 15.^s
Decl. - 6° 4' A

1875.56	141.7	1.20	7.2...	9.3	5 ^m	J
1879.01	149.1	1.55	7.50	10.0	1 ⁿ	OΣ
1879.17	141.5	1.29	7.2...	9.2	1 ⁿ	Sp
1884.25	137.8	1.70	...	...	3 ⁿ	11Σ
1891.72	137.4	1.23	7.1...	9.3	3 ⁿ	β

Discovered with the 6-inch. Little or no change
A distant companion in 45.

[β (v)...β (*Mon. Not.* XXXV, 311)...β (3114)...β (*Puls. L. O.*
n)...δ (1)...OΣ (*Pulsars Obs.* X). Sp. 11...11Σ
(...)]

β 144. D.M. (30) 3664R.A. 16^h 33^m 3.^s
Decl. + 30° 5' A

1875.37	351.0	6.34	8.9...	8.9	1 ⁿ	J
1880.43	352.1	6.24	8.7...	8.8	1 ⁿ	β
1883.76	350.9	6.48	9.1...	9.1	0 ⁿ	En
1888.77	351.0	6.57	...	...	2 ⁿ	Maw

Discovered with the 6-inch. Fixed.

[β (m)...β (*Mon. Not.* XXXIV, 59)...β...δ (1)...Engel-
mann (2978)...Maw (*Mem. R. A. S.* 1, 75)...]

β 1131. θ *Ugni*R.A. 16^h 33^m 13.^s
Decl. + 49° 36' A

A and B

1889.37	43.9	3.62	5...	14.3	3 ^m	β
1892.38	47.0	3.79	...	14.5	1 ⁿ	β
1898.46	49.2	3.37	...	...	1 ⁿ	β
1898.63	46.9	3.71	5...	14.5	3 ^m	A

A and C

1852.69	186.1	29.90	...	11.0	1 ⁿ	OΣ
1882.62	183.8	37.27	...	...	1 ⁿ	OΣ
1898.45	182.8	42.16	...	1.53	3 ⁿ	β
1899.55	183.0	42.30	...	...	1 ⁿ	β

The close star was discovered with the 36-inch.
It is a difficult object and beyond the reach of all
but large refractors. AUWERS gives the proper
motion of θ *Ugni*, 2.44 in the direction of 351.8.

It is evident from the measures that the faint com-
panion is moving with it, and we certainly have a
most interesting physical system. So far the rela-
tive change is small. The change in C is accounted
for by the proper motion of A, which is nearly
in the opposite direction, and therefore principally
affects the distance.

[δ (X31)...δ (29122) (50, 3142)...β (*Puls. L. O.* 11)...Aitken
(3585)...OΣ (*Pulsars Obs.* X, 105)...]

β 1287R.A. 16^h 34^m 5.^s
Decl. - 10° 36' A

1899.44	144.0	1.07	10...	10	1 ⁿ	β
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A close pair of small stars found with the 40-inch.
This star is not given in S.D. It is 245.5 from
54 *Sagittarii* in the direction of 111° 7 (1899.44).

β 977. Lalande 37329R.A. 16^h 34^m 1.^s
Decl. - 4° 4' A

1880.70	58.9	3.78	8.3...	12.3	3 ^m	β
1891.63	56.7	4.14	8.1...	13.7	2 ⁿ	β
1898.62	52.0	3.76	8.2...	13.5	1 ⁿ	D

Discovered with the 18½-inch.

[δ (X70)...δ (3114)...δ (*Puls. L. O.* 11)...Dunne (*Puls.*
Flower Obs. 1)...]

β 54. W. XIX. 1888R.A. 16^h 34^m 4.^s
Decl. + 2° 28' A

A and C

1876.61	333.5	21.86	...	11.5	1 ⁿ	OΣ
1878.47	303.4	20.95	...	...	1 ⁿ	β
1880.43	301.3	21.12	...	...	1 ⁿ	β

A and B (1887)

1831.78	104.7	11.42	7.3	6.8	3 ^m	Σ
1843.77	105.7	11.17	...	...	3 ^m	Mu
1868.32	104.1	11.10	7.2...	10.0	3 ^m	J
1870.01	104.2	11.22	...	...	0 ⁿ	OΣ
1879.48	103.9	10.94	...	...	2 ⁿ	β

The above double pair was added with the 6-inch. Neither of the companions is likely to be of much interest. The above are all the measures of β 188. The distance is ≈ 11720 belong to H 2888, another double of the same RA, and exactly the same.

[*2 (1) ... 2 Mon. Not. XXXII, 351) ... β ... β ... Madler (Fix-
tura Stellarum, p. 11, 1830, 1831, 1832, 1833, 1834, 1835,
1836) ... O Σ (Poulkova Obs., X) ...]*

β 1288. γ 55 γ 55 γ 55

R.A. 19^h 23^m 11^s 1
Dec. -46° 23' 1

In looking over my Mt. Hamilton observing books I find that on June 7, 1889, I examined this star with the 12-inch, and recorded it as a close equal pair, with magnitudes $5\frac{1}{2}$ and $5\frac{1}{2}$, and "distance less than $0''.2$." The angle was measured with the highest power of that instrument, giving $340^\circ 7'$. This observation was overlooked by me, and the star not subsequently examined either with the 12 or 36-inch. As I have no reason to doubt the substantial correctness of the original observation, I give this star a place here, with the confident expectation that it will be hereafter verified. PROFESSOR ATKIN has examined it with the 36-inch several times this year (1899) at my request. At one time there was a slight suspicion of possible elongation, but it double it was too close for even that instrument.

β 656. γ 14 γ 14 γ 14

R.A. 19^h 23^m 11^s 1
Dec. -46° 23' 1

1878.33	298.2	0.87	8.0...	9.2	3m	β
1878.63	258.1	0.93	8.3...	9.0	3m	J
1883.53	260.9	1.08	...	...	1m	H Σ
1888.78	266.4	0.73	...	...	5m	Sp
1893.50	266.1	0.87	8.4...	9.1	3m	W

Discovered with the 18 $\frac{1}{2}$ -inch. ROGERS (*A. G. Catalogue*) gives the star a proper motion of $0''.046$ in the direction of $96^\circ 0$. The measures show no relative motion.

β 145. γ 14 γ 14 γ 14

R.A. 19^h 23^m 11^s 1
Dec. -46° 23' 1

A and B

1878.13	298.2	0.87	6.8...	6.5	4m	J
1878.63	258.1	0.93	7.2...	6.7	2m	O Σ
1883.53	260.9	1.08	...	...	1m	H Σ
1888.78	266.4	0.73	...	...	4m	Sp
1893.50	266.1	0.87	7.2...	6.7	3m	W

AB and C

1878.43	32.6	8.51	7.5...	13.0	1m	β
1870.66	24.5	9.62	...	11.8	2m	O Σ
1883.53	28.5	9.28	...	...	1m	H Σ
1893.50	28.7	9.30	...	12.8	2m	W

AB and D

1878.78	155.9	27.39	...	13.5	1m	O Σ
1878.43	157.3	26.07	...	13.8	1m	β
1885.53	156.9	26.80	...	...	1m	H Σ
1893.50	157.6	26.76	...	11.6	2m	W

Discovered with the 6-inch.

[*2 (1) ... 2 Mon. Not. XXXIV, 56) ... β ... β ... O Σ (Poul-
kova Obs., X) ... Wilson () ...]*

β 827. γ 14 γ 14 γ 14

R.A. 19^h 23^m 11^s 1
Dec. -46° 23' 1

1881.62	268.8	0.87	8.3...	9.1	3m	β
1881.5	261.9	0.98	8.5...	9.5	3m	Com
1893.76	264.5	1.02	8.5...	9.7	3m	W

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. The measures credited to this star by COLLINS (*Proc. Haverford Coll. Obs.*, 1891) belong to a new pair $15'' n$ of β 827. It is somewhat similar to this in angle and magnitudes. COLLINS gives $25178 : 1534 : 8.5...9.5$ (1891.72) 2m.

[β (XII) ... β ... Comstock (*Pub. Washburn Obs.*, vi) ... Wilson () ...]

β 1132. γ 14 γ 14 γ 14

R.A. 19^h 23^m 11^s 1
Dec. -46° 23' 1

1880.56	227.3	0.49	8.3...	8.7	3m	β
1897.68	227.1	0.47	...	...	2m	Lew
1898.82	225.2	0.42	8.3...	9.6	2m	A

β 828. D.M. 15 11 12.0

R.A. 10^h 11^m 12.0^s
Decl. + 8° 55' 3"

1880.1	1.4	2.81	8.8	10.2	39	β
1880.1	1.4	2.82	8.8	10.0	39	Com
1880.1	1.4	2.82	8.8	10.2	39	β
1880.1	0.4	2.57	8.3...	10.5	29	β

Discovered with 4½-inch at the Washburn Observatory. Without change.

[*Proc. Washburn Obs.*, 1880, p. 100; *Pub. Washburn Obs.*, VII, ...]

 β 147. D.M. 15 11 13.0

R.A. 10^h 11^m 13.0^s
Decl. + 8° 55' 3"

1877.07	300.4	8.55	8.5...	10.0	29	β
1893.54	207.6	8.86	8.3...	10.2	39	Lv
1893.54	207.6	8.86	8.8	10.5	39	D

Discovered with the 6-inch. No motion.

[*Proc. Washburn Obs.*, 1877, p. 110; *Pub. Washburn Obs.*, I, ...]

 β 829. D.M. 15 12 3.0

R.A. 10^h 12^m 3.0^s
Decl. + 8° 55' 3"

1881.65	100.0	0.72	8.4...	8.8	39	β
1880.1	100.0	0.93	8.5...	10.0	39	Com
1880.1	100.0	0.80	8.0...	8.6	29	Lv
1880.1	306.6	0.60	8.5...	8.7	19	Ho
1880.1	308.6	0.72	8.0...	8.7	49	Lv
1893.64	308.6	0.83	8.2...	8.6	39	A

Discovered with the 15½-inch at the Washburn Observatory. The measures are not consistent in angle, but there is probably no material change.

[*Proc. Washburn Obs.*, 1880, p. 100; *Pub. Washburn Obs.*, VII, ...]

 β 861. D.M. 15 12 10.0

R.A. 10^h 12^m 10.0^s
Decl. + 8° 55' 3"

1880.1	100.0	0.81	8.4...	10.0	39	β
1880.1	100.0	0.81	8.4...	10.0	39	Lv

Discovered with the 6-inch. In a low-power field with 12 *Vulpeculae*.

[*Proc. Washburn Obs.*, 1877, p. 110; *Pub. Washburn Obs.*, I, ...]

 β 148. D.M. 15 12 27.0

R.A. 10^h 12^m 27.0^s
Decl. + 8° 55' 3"

A and B

1878.26	333.2	0.91	7.9...	8.3	19	J
1879.25	331.2	0.87	7.8...	8.4	19	Com
1888.51	325.9	0.79	8.0...	8.5	19	Lv
1891.63	323.3	0.78	7.4...	7.7	29	β
1893.66	322.5	0.78	7.8...	8.5	39	W
1893.75	321.4	0.5	7.9...	8.4	39	D

A and C

1891.63	61.7	26.32	13.5	29	β
1893.62	63.3	29.3	12.8	19	W
1893.75	64.0	27.13	12.6	39	D

Discovered with the 6-inch. There seems to be slow retrograde motion in the angle of the close pair.

[*Proc. Washburn Obs.*, 1877, p. 110; *Pub. Washburn Obs.*, I, ...]

 β 978. W + NIN. 1479

R.A. 10^h 14^m 27.0^s
Decl. + 8° 55' 3"

1880.48	234.2	0.94	8.3...	8.4	39	β
1889.84	235.6	0.99	8.4...	8.5	19	Sp
1898.64	233.8	1.05	8.5...	8.5	39	A

Discovered with the 18½-inch.

[β (xii)... β ...Sp (iii)...Aitken (3585)...]

 β 979. W + NIN. 1479

R.A. 10^h 14^m 27.0^s
Decl. + 8° 55' 3"

1880.49	330.7	2.24	8.3...	11.1	39	β
1893.53	335.9	2.25	8.4...	11.5	49	Lv

Discovered with the 18½-inch.

[β (xii)... β ...Lv (A. J. 382)...]

β 650. Rottenberg 7411

R.A. 15 48 28.6
Dec. 1 50.8

1878.62	316.0	12.32	6.5...12.5	1m	β
1884.58	314.2	12.33	...	2m	H Σ
1891.50	315.0	12.33	6.6...12.5	3m	β
1898.68	314.5	12.47	6.7...12.3	3m	D

Discovered with the 18 $\frac{1}{2}$ -inch. The change, if any, is small. This is D.M. (6 $^{\circ}$) 4351, 7.0 m.

[β (XII)... β (111)... β (206)... β (11) Doolittle (*Pub. Flower Obsy.* 1)...H Σ ()...]

 β 830. Lalande 3704

R.A. 16 51 57.7
Dec. 1 10.3

1881.74	106.4	2.72	8.2...11.2	2m	β
1886.80	106.3	2.69	7.7...11.2	2m	H Σ
1886.87	105.6	2.90	...	2m	U.L.
1887.81	106.0	2.81	8.2...11.8	3m	Com

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. Without change.

[β (XII)... β (111)... β (206)... β (11) Doolittle (*Pub. Washburn Obsy.* VI)...Comstock (*Pub. Washburn Obsy.* VI)...]

 β 880. η (3292)

R.A. 16 51 48.7
Dec. 1 34.8

A and B

1879.89	209.6	7.07	5...13	3m	β
1887.27	207.3	7.44	...	3m	H Σ
1889.51	210.4	7.23	4...13	1m	β
1898.56	208.2	7.23	...	2m	β
1898.91	209.0	7.75	4...14.2	2m	A

A and C (H 1433)

1828	332.0	30 \pm	...	1m	H
1879.47	328.3	30.17	...	1m	β
1889.51	326.2	46.08	...	2m	β
1898.56	326.2	46.00	...	2m	β

A and D (H 1433)

1828	170.0	20.0	...	1m	H
1879.47	170.0	19.52	...	1m	β
1889.51	169.1	49.82	...	2m	β
1898.56	168.0	49.65	...	2m	β

A and E

1828.56	247.3	61.72	...	1m	β
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The faint companion was detected with the 18 $\frac{1}{2}$ -inch. AUWERS gives the proper motion of η Cygni as 0.046 in the direction of 231 $^{\circ}$. This movement would increase the distance of B, if fixed, about 0.4 in the time covered by the measures. The object is not an easy one to measure, and it is impossible at this time to say whether these stars have the same proper motion. The probabilities are that they form a system. The relation will be apparent from the measures of the next few years.

The distant stars, C and D, noted by HERSCHEL (*Fourth Catalogue*), can only be optical companions. All the measures of these stars are given.

[β (XII)... β (2957)... β (*Pub. L. O. II*)...H Σ ()...Aitken (3585)...]

 β 831. D.M. 447 2435

R.A. 16 51 50.7
Dec. 1 47.3

1881.45	128.0	0.94	8.6...9.1	3m	β
1888.22	128.3	0.92	8.9...9.6	3m	Com
1898.54	128.4	1.08	8.6...9.3	3m	D

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. Without change.

[β (XII)... β ...Comstock (*Pub. Washburn Obsy.* VI)...Doolittle (*Pub. Flower Obsy.* 1)...]

 β 266. W. N. N. 123

R.A. 16 51 48.7
Dec. 1 34.8

1878.31	167.3	18.03	...	1m	β
1889.57	167.7	18.44	...	1m	β
1898.55	166.4	18.23	7.5...8.8	3m	D

Discovered with the 6-inch.

[β (XII)... β (206)... β (11) Doolittle (*Pub. Flower Obsy.* 1)...Comstock (*Pub. Washburn Obsy.* VI)...]

evidently a case of unusual motion in a pair of this kind, or of mistaken identity. The matter was investigated with the 36-inch, and it was found that the measure of 1878 belonged to a new pair 30" ρ β 439. There is no obvious change in the components.

[β XVIII. β (1113). β 3 *Par. L. O. II.* Aiken, *J.* 429)... Lewis and Bowyer (*Mon. Not. LIX*, 400)...]

 β 439. D.M. (277) 3843

R.A. 19^h 58^m 57^s 1
Decl. δ 26 $^{\circ}$ 40' 0"

1876.80	249.7	2.70	8	...	19	β
1891.50	248.2	3.05	7.9	...	12.7	30 β
1897.75	241.8	3.28	...	...	19	L

Discovered with the 18½-inch. The measure in β 7, credited to this pair, really belongs to a new pair in the field $\eta\beta$. (See β 1258.)

[β XVIII. β 3 *Am. Jour. Sci. New* 1877. β (1113). β 3 *Par. L. O. II.*)... Lewis (*Mon. Not. LIX*, 400)...]

 β 1289. W. XIX. 1833

R.A. 19^h 50^m 38^s 1
Decl. δ 37 $^{\circ}$ 23'

A and B

1899.32	57.7	0.84	8.3	...	9.2	30 β
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A and C

1899.32	90.0	21.31	...	9.0	30 β
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The close pair was discovered with the 18½-inch July 13, 1880, but forgotten at the time, and only found upon a recent examination of the old observing records of twenty years ago. The measures given above were made with the 40-inch. C is W¹⁹ XIX. 1838. The distance from the meridian positions of 1825 is 22 $^{\circ}$ 41'.

 β 56. Lalande 38343

R.A. 19^h 58^m 47^s 1
Decl. δ 4 $^{\circ}$ 20'

1875.43	192.2	1.61	8.2	...	6.2	40 β
1879.26	191.3	1.57	7.7	...	6.0	30 β
1886.73	195.0	1.65	7.1	...	8.0	30 β

1888.57	165.6	1.70	7.7	...	9.0	100 β
1892.70	168.2	2.43	7.5	...	9.1	100 β
1896.52	165.7	1.55	8.0	...	8.9	30 β
1898.62	167.4	1.71	...	...	...	100 β
1898.63	166.1	1.55	8.2	...	...	30 β

Discovered with the 6-inch. Probably fixed.

[β (1)... β (*Mon. Not. XXXIII*, 351). β 105. I.M. ...
...Lv¹...Lv (*A. J.* 407)...Glasenapp (11)...Boothroyd
and Cogshall (...)]

 β 426 and β 427. O. Arg. N. 14338

R.A. 19^h 50^m 13^s 1
Decl. δ 34 $^{\circ}$ 18'

A and B β 426

1877.05	310.0	5.75	8.2	...	10.2	60 β
1884.49	311.5	6.02	8.3	...	10.1	60 β
1893.49	310.1	5.71	8.1	...	10.2	30 β
1898.48	308.8	5.78	8.6	...	9.1	30 β

C and D β 427

1877.25	330.5	3.01	8.1	...	10.0	60 β
1884.49	337.3	3.18	8.3	...	10.0	60 β
1893.49	335.7	2.93	8.3	...	10.5	30 β
1898.48	333.8	2.90	8.5	...	9.5	30 β

A and C

1877.18	53.3	166.17	...	...	...	100 β
1884.78	53.4	165.99	...	...	...	100 β
1898.48	53.2	164.64	...	...	...	30 β

The two pairs, forming a wide quadruple group, were discovered with the 6-inch. All are probably relatively fixed. C is O. Arg. N. 19952.

[β (VII)... β (2103)...J (1)...Engelmann (2742)...Lv (*A. J.* 382)...Doolittle (*Pub. Flower Obs.* 1)...]

 β 57. Lalande 38403

R.A. 19^h 50^m 28^s 1
Decl. δ 18 $^{\circ}$ 53'

1878.10	118.9	2.13	6.2	...	10.0	30 β
1876.60	120.7	2.09	6.5	...	...	100 β
1877.70	123.4	2.50	...	...	...	30 β
1881.30	122.8	2.43	...	...	...	30 β
1891.28	118.3	2.00	6.7	...	10.3	30 β

General Catalogue of Double Stars

Discovered with the 6-inch. Without change.
The magnitude in D.M. is 6.0; Harvard, 6.5.

1877.13 28.8 7.75 7.4 11.0 2m J
1878.43 28.1 7.80 11.0 1m B
1879.80 28.3 8.12 11.0 1m Ho

And C (= 4150)

1877.13 28.8 7.75 7.4 11.0 2m J
1878.43 28.1 7.80 11.0 1m B
1879.80 28.3 8.12 11.0 1m Ho

And F (= 4151)

1877.13 28.8 7.75 7.4 11.0 2m J
1879.80 28.3 8.12 11.0 1m Ho

And D (= H¹ III, 113 = Sh 311)

1877.13 28.8 7.75 7.4 11.0 2m J
1878.43 28.1 7.80 11.0 1m B
1879.80 28.3 8.12 11.0 1m Ho

And E

1877.13 28.8 7.75 7.4 11.0 2m J
1878.43 28.1 7.80 11.0 1m B
1879.80 28.3 8.12 11.0 1m Ho

F and G

1877.13 28.8 7.75 7.4 11.0 2m J
1879.80 28.3 8.12 11.0 1m Ho

The near faint companions were discovered with the 18½-inch. A, D, and F make the wide triple, H¹ III, 113 = Sh 311 = Σ 2633 2971. These stars are probably unchanged. All the measures are given above.

[β (vii, viii)...β (2103) (*Am. Jour. Sci.* July 1877)...β¹...δ (i)...Hough (3234)...]

β 470. O Ape N. 20079

R.A. 20^h 31^m 11^s
Decl. + 65° 25' 3"

1877.59 214.8 2.47 9.5 11.0 2m J
1879.58 215.7 2.45 9.5 11.0 3m W

Discovered with the 6-inch. In the field 16 β
2103 2104 Σ 2632

[β (i)...β (Mon. Not. XXXVIII, 78)...δ (i)...Wilson ()...]

β 832. O Ape N. 20079

R.A. 20^h 31^m 11^s
Decl. + 65° 25' 3"

1881.05 10.0 1.02 8.6... 9.0 3m J
1886.74 10.1 1.00 9.0 1m M
1886.87 10.1 1.00 9.0 2m U
1887.70 10.1 1.02 8.6... 3m C
1888.51 10.2 1.04 8.7... 3m L
1889.08 10.2 1.00 8.7... 3m C

Discovered with the 15½-inch at the Washburn Observatory. The measures show no change.

1881.05 10.0 1.02 8.6... 9.0 3m J
1886.74 10.1 1.00 9.0 1m M
1886.87 10.1 1.00 9.0 2m U
1887.70 10.1 1.02 8.6... 3m C
1888.51 10.2 1.04 8.7... 3m L
1889.08 10.2 1.00 8.7... 3m C

β 428. O Ape N. 20079

R.A. 20^h 31^m 11^s
Decl. + 65° 25' 3"

1876.49 313.7 4.12 7.2... 8.5 2m J
1878.58 313.8 4.12 7.5... 9.5 1m OΣ
1885.52 315.5 4.60 7.5... 8.8 1m HΣ
1887.46 315.4 4.60 7.5... 8.8 1m L
1888.80 315.4 4.68 7.8... 9.2 1m W
1889.16 315.6 4.68 7.8... 9.2 1m D

1889.16 315.6 4.68 7.8... 9.2 1m D

1889.16 315.6 4.68 7.8... 9.2 1m D

β 429 and β 440. O Ape N. 20079

R.A. 20^h 31^m 11^s
Decl. + 65° 25' 3"

1876.50 61.3 6.47 7.0... 12.0 1m β
1878.53 61.1 6.63 7.0... 12.5 1m β
1880.51 61.1 6.63 7.0... 12.5 1m β

β 833. Ialande 38625

R.A. 20 ^h 58 ^m 11 ^s .1		Decl. - 0° 36' N		Band C	
	λ		λ		
1881.74	63.7	2.30	8.8...	11.7	2H β
1884.82	58.4	2.10	8.5...	11.5	1H Ho
1886.86	76.0	2.52	...	...	1H UL
1888.08	50.2	2.45	8.5...	12.1	3H C III
1898.53	59.0	2.18	8.9...	12.5	3H C III
1898.62	57.7	2.41	8.3...	11.6	3H A
1898.73	61.1	2.13	...	12.6	4H Bb

A and B

1881.74	63.5	118.58	8.4...	2 ⁿ	β
1886.86	63.0	119.65	...	3 ⁿ	UI
1898.60	63.1	119.74	8.0... 8.3	3 ⁿ	A
1898.72	63.1	120.66	8.0... 8.5	3 ⁿ	Bd

Discovered with the 15½-inch at the Washburn Observatory. Probably no change. BOOTHROYD measures a 12m star from A. 357.2 : 43.63 (1898.72) 3n.

[β (xii)... β^4 ...Hough (2978)...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken (3585)...Boothroyd ()...]

β 1205. Lalande 38649

		R.A. 20 ^h	5 ^m	17 ^s	$\frac{t}{s}$	
		Decl.	8	27	'	
1890.63	50.0	0.56	8.1	...	9.4	3 ⁿ β
1897.71	46.6	0.70	...	...	...	3 ⁿ A
1897.79	48.2	0.59	...	...	1.0	Br

Discovered with the 12-inch. In S.D. 7.0 m.

[β (xvii)... β (3047)... β (*Pub. L. O.* II)...Aitken (*A. J.* 429)
...Brown ()...]

β 150. W² NN. 176

		R.A. 20 ^h 5 ^m 50 ^s ± 1		Decl. +33° 17' ± 1		
		B and C				
	λ	λ	λ	λ	λ	
1840.82	191.6	1.55	8.0...	0.5	100	OS
1875.45	187.1	1.66	8.1...	10.0	10	J
1893.51	187.7	1.85	8.0...	0.8	39	IV
1898.75	187.2	1.78	...	0.6	46	IV

A and B are 2×2 matrices

1824.69	112.5	41.80	5...	10	S
1840.82	111.7	41.24	7.5...	10	OS
1875.76	110.3	41.15	7.0...	10	J
1885.91	110.3	41.40		50	1885
1898.74	109.2	41.26	7.1...	20	D

The duplicity of the smaller member of the wide pair, S 738, was discovered with the 6 inch. It had been previously seen, however, and was given as $\Theta\Sigma_{11}$ in the *Pearl's and Gerasimovic's* IX, published after β (iii). All the measures of these stars are given above. There is no evidence of change.

[β (III)... β (*Mon. Not.* XXXIV, 59)... Δ (I)...O Σ (*Poulkowa Observations* IX, x, p. 45)...I.v (*A. J.* 382)...Engelhardt (2785) (*Astron. Obsns.* II)...Doolittle (*Pub. Flower Obsy.* 19...)]

β 430. D.M. 135. 1478

R. A. 20° 48' 48" E
Decl. + 35° 28' 48" N

A and B

1877.30	18.7	1.10	9.3...10.2	3 ⁿ	J
1893.51	21.1	0.98	8.9...10.0	3 ⁿ	Lv
1898.76	23.8	0.97	8.7... 9.7	4 ⁿ	D

AB and C (H 1489)

1828	230.3	13	9.12	10	10	11
1877.61	51.3	17.09	9.3	9.2	20	2
1893.55	52.5	17.15		9.3	10	1
1898.76	51.6	16.87		9.8	47	1

The close pair was discovered with the 6-inch. It is probable there is an error of 180° in the angle of the wide pair by H, as the ρ star is obviously the brightest, and so in D.M., where the respective magnitudes are 0.3 and 0.5.

β 082. D M 125. 0114

K. A. 2000-2001 81 7
Dec 00 2001 1 0

1880-47	51.2	0.87	8.8	0.00	25	3
1848-81	51.1	0.81	6.1	1.00	25	1A

Discovered with the 18½-inch. It is the *sf* star of a wide pair. Located as a *g* 2.5 star.

$$|y - x_{\text{min}}| \leq |x - x_{\text{min}}| + |z| = |x - x_{\text{min}}| + \delta_2 = \delta$$

β 442. W² XX. 417R.A. 20^h 12^m 47^s 1
Decl. + 37° 13' 1"

A and B

1876.77	104.1	18.47	8.0...	8.5	1 ^u	β
1879.43	103.7	19.02	8.0...	9.5	1 ^u	Cin
1898.60	102.2	18.83	...	...	1 ^u	β

B and C

1876.77	48.6	17.69	...	8.5	1 ^u	β
1879.47	48.5	17.41	7.0...	8.5	2 ^u	Cin
1898.76	50.0	16.82	...	...	1 ^u	β

A and *a*

1876.77	157.5	4.40	...	...	1 ^u	β
1879.47	155.3	4.01	8.7...	10.2	2 ^u	Cin
1898.60	156.9	3.88	...	...	1 ^u	β

A and *b*

1876.77	157.7	7.7	...	...	1 ^u	β
1888.60	156.7	9.01	...	...	1 ^u	β

A and *c*

1876.77	332.5	19.55	...	...	1 ^u	β
1879.43	331.2	18.88	...	10.5	1 ^u	Cin
1898.60	333.2	19.01	1 ^u	β

B and *d*

1898.76	138.1	3.68	...	14	1 ^u	β
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B and *e*

1876.77	164.3	8.12	1 ^u	β
1879.43	165.3	5	...	13	1 ^u	Cin
1898.60	163.7	6.77	1 ^u	β

C and *f*

1879.43	109.4	11.26	...	11.0	1 ^u	Cin
1898.60	110.3	12.65	...	...	1 ^u	β

C and *g*

1879.43	116.1	20.52	...	11.0	1 ^u	Cin
1898.60	116.2	20.83	...	...	1 ^u	β

C and *h*

1879.43	305.6	15.7	...	13.0	1 ^u	Cin
1898.60	306.1	15.57	...	...	1 ^u	β

A multiple star or group, discovered with the 18½-inch, except the extremely faint star *d*, which was detected with the 40-inch in measuring the other stars. This is probably only a perspective group.

[A (III), B (I), C (I), D (I), E (I), F (I), G (I), H (I), I (I), J (I), K (I), L (I), M (I), N (I), O (I), P (I), Q (I), R (I), S (I), T (I), U (I), V (I), W (I), X (I), Y (I), Z (I)]

β 984. D.M. (25^u) 4184R.A. 20^h 12^m 41^s 1
Decl. + 37° 13' 1"

1880.47	204.1	6.86	7.9...	8.2	2 ^u	β
1883.70	199.8	6.63	8.0...	8.5	3 ^u	H ₂
1888.49	203.1	...	...	...	1 ^u	Lv
1890.85	207.5	6.73	...	...	7 ^u	Sp

Discovered with the 18½-inch.

[β (xiii)...β¹...Hough (2978)...Lv¹...Sp (iii)...]**β 441.** Lalande 39013R.A. 20^h 12^m 37^s 1
Decl. + 28° 29' 1"

1876.80	65.4	5.87	7.0	...	1 ^u	β
1877.68	67.6	5.74	6.7	11.5	2 ^u	β
1878.58	67.5	6.07	7.0	11.0	1 ^u	β
1880.47	65.7	5.67	6.5	11.5	1 ^u	β
1883.62	65.5	6.10	...	...	7 ^u	H ₂
1893.51	65.6	5.93	6.3	11.5	3 ^u	Lv
1896.80	66.3	5.70	...	...	3 ^u	Morgan

Discovered with the 18½-inch. Without change.

[A (III), B (I), C (I), D (I), E (I), F (I), G (I), H (I), I (I), J (I), K (I), L (I), M (I), N (I), O (I), P (I), Q (I), R (I), S (I), T (I), U (I), V (I), W (I), X (I), Y (I), Z (I)]

β 661. (25^u) 1171R.A. 20^h 12^m 37^s 1
Decl. + 28° 29' 1"

1878.52	67.5	12.60	6.2	12.5	2 ^u	β
1881.50	66.5	12.81	...	...	2 ^u	H ₂
1891.50	65.1	12.60	5.8	12.2	3 ^u	β

Discovered with the 18½-inch. The Harvard photometric magnitude is 8.3. R.A.C. 6180.

[A (III), B (I), C (I), D (I), E (I), F (I), G (I), H (I), I (I), J (I), K (I), L (I), M (I), N (I), O (I), P (I), Q (I), R (I), S (I), T (I), U (I), V (I), W (I), X (I), Y (I), Z (I)]

β 985. AU XX 448

(α 3^h 40^m 34^s)
 (Decl. $-1^{\circ} 48' 30''$)

$\lambda = 0^{\circ} 10'$

1880.66	111.7	4.43	5.3	13.5	3 ^m β
1890.66	146.8	4.72	6.8...	13.5	2 ^m λ

α and λ

1890.66	111.8	46.34	14.7	3 ^m W
1890.66	146.7	0.14	15.0	2 ^m λ

λ and β (α H 1433)

1890.66	111.4	15.2	8	11.3	3 ^m H
1890.66	146.8	10.0	10.3	3 ^m	β
1890.66	111.4	21.34	7.4	10.2	3 ^m W
1890.83	355.8	21.64	10.0	2 ^m	λ

Discovered with the 18 $\frac{1}{2}$ -inch. All the measurements are given here.

(α 3^h 40^m 34^s)... (Decl. $-1^{\circ} 48' 30''$)...]

 β 662. S.D. (20^h) 5904

(α 2^h 40^m 34^s)
 (Decl. $-1^{\circ} 48' 30''$)

1890.66	111.7	4.43	5.3	13.5	β
1890.66	146.8	4.72	6.8...	13.5	3 ^m λ

Discovered with the 18 $\frac{1}{2}$ -inch. This is the most northern of two small stars 2.7 apart. A 7 $\frac{1}{2}$ in star 28' ρ and 2'6 s.

(α 2^h 40^m 34^s)...]

 β 985. AU XX 448

(α 3^h 40^m 34^s)
 (Decl. $-1^{\circ} 48' 30''$)

1890.51	242.1	4.41	8.1...	10.4	3 ^m β
1892.72	240.6	4.20	8.5...	10.3	3 ^m W

Discovered with the 18 $\frac{1}{2}$ -inch.

(α 3^h 40^m 34^s)... Wilson ()...]

 β 1206. Lacaille 33113

(α 2^h 40^m 34^s)
 (Decl. $-1^{\circ} 48' 30''$)

1890.51	242.1	4.41	8.1...	10.4	3 ^m β
1892.72	240.6	4.20	8.5...	10.3	3 ^m W
1890.51	242.1	4.41	8.1...	10.4	3 ^m β
1892.72	240.6	4.20	8.5...	10.3	3 ^m W

Discovered with the 36-inch.

(α 2^h 40^m 34^s)... (Decl. $-1^{\circ} 48' 30''$)... Aitken (4, 420)
 ... Lewis (Mon. Not. LIX, 400)... Brown ()...]

 β 431. W XX 343

R.A. 20^h 15^m 45^s
 Decl. $-1^{\circ} 48' 30''$

1877.33	242.8	5.26	8.5	8.8	6 ^m	λ
1881.25	12.4	5.72			3 ^m	H ₂
1881.84	5.41	5.17	8.5	8.5	7 ^m	En
1880.53	38.2	5.66	8.6	8.6	4 ^m	β
1898.60	38.2	5.78	8.4	8.5	3 ^m	λ

Discovered with the 6-inch. Change uncertain.

(α 20^h 15^m 45^s)... (Decl. $-1^{\circ} 48' 30''$)... Engel-
 man (2747)... H2... Aitken (3885)...]

 β 763. κ Sagittarii

R.A. 20^h 15^m 45^s
 Decl. $-1^{\circ} 48' 30''$

1887.38	243.3	5.93	7	8	1 ^m Pol
1889.47	241.2	5.33	6.0...	8.9	4 ^m β
1891.04	240.0	5.88	6	9	1 ^m Sel
1894.71	243.4	5.73	6	8	2 ^m Sel
1897.78	195.1	1.40	7.0...	8.9	1 ^m See
1898.58	242.9	1.00	6.0...	8.8	3 ^m λ

Discovered with the 6-inch at Mt. Hamilton in 1879. The Caribbea magnitude is 5.6. Probably unchanged. See measurements at most 200, 3 : 29 : 31 (1897.78) 1^m.

(α 20^h 15^m 45^s)... (Decl. $-1^{\circ} 48' 30''$)... Proctor (Pub.
 ... 1891.04)... Mon. Not. LXXV, 470)... Mon. R. A.
 S. 1)... Sollers (3154, 3393)... Aitken (3585)...]

 β 1207. Lacaille 33115

R.A. 20^h 15^m 45^s
 Decl. $-1^{\circ} 48' 30''$

1890.58	247.8	5.76	7.7...	13.5	3 ^m β
1890.58	247.7	5.75	7.3...	13.5	3 ^m λ

Discovered with the 36-inch. One of the Wolf-Rayet stars in Cygnus.

(α 20^h 15^m 45^s)... (Decl. $-1^{\circ} 48' 30''$)... Aitken (3885)...]

β 1259. W. & NN, 563

R.A. 20^h 16^m 27^s $\frac{1}{2}$
Decl. +30° 13' $\frac{1}{2}$

1891.65	171.9	0.47	8.3...	8.7	3 ⁿ	β
1895.01	172.9	0.37	...	...	5 ⁿ	Sp
1898.60	107.5	0.63	8.6...	8.7	3 ⁿ	Λ

Discovered with the 36-inch. It is 11^s ρ a 7 m star.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Sp (III)...Aitken (3585)...]

β 1260. D.M. (55°) 2368

R.A. 20^h 16^m 33^s $\frac{1}{2}$
Decl. +55° 10' $\frac{1}{2}$

1891.57	166.4	0.47	8.2...	10.8	3 ⁿ	β
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Discovered with the 36-inch. This is 18' n of of Σ 2701.

[β (xviii)...β (3113)...β (Pub. L. O. II)...]

β 663. Lalande 39260

R.A. 20^h 17^m 10^s $\frac{1}{2}$
Decl. +53° 13' $\frac{1}{2}$

A and B

1891.51	313.6	6.58	6.3...	15.2	2 ⁿ	β
1898.67	311.4	7.80	6.0...	15.5	1 ⁿ	A

A and C

1877.57	79.4	8.3±	...	12.5	1 ⁿ	β
1885.52	77.5	7.80	...	...	2 ⁿ	IIΣ
1891.53	75.2	7.67	...	12.5	3 ⁿ	β
1898.67	76.7	7.60	...	13.0	1 ⁿ	Λ

The faint star, C, was discovered with the 18½-inch, and in measuring that with the 36-inch a still nearer companion was detected. This is a difficult object with a large aperture. ROGERS (*A. G. C.*) gives the proper motion, 0.092 in the direction of 270°.

[β (x)...β...β (3111)...β (Pub. L. O. II)...Aitken (358)...IIΣ (...)]

β 665. γ C₃₉ 191

R.A. 20^h 17^m 32^s $\frac{1}{2}$
Decl. +53° 32' $\frac{1}{2}$

B and C

1878.52	305.1	1.41	10.0...	11.0	2 ⁿ	β
1891.53	302.0	1.78	10.4...	11.1	3 ⁿ	β
1898.55	300.2	1.86	10.0...	11.5	3 ⁿ	A

A and BC

1878.19	199.5	140.44	2.3...	...	3 ⁿ	β
1891.53	196.4	141.13	...	...	3 ⁿ	β
1898.54	196.2	141.32	...	...	1 ⁿ	A

The distant double companion was discovered with the 18½-inch. There are several small stars nearer A than this. AUWERS gives the proper motion of γ C₃₉ 191 in the direction of 176.5°.

MITCHELL at Cincinnati has a companion which is ascribed to γ C₃₉ 191 233.8 ± 33.8 11.847 5.44. He gave the colors, A red, B greenish. There is no doubt that the observation really belongs to β C₃₉ 191, there being an error of 180° in the position angle. With this correction the measure and description apply perfectly.

[β (x)...β...β (3114)...β (Pub. L. O. II)...Aitken (358)...]

β 664. Aquilae 264

R.A. 20^h 18^m 5^s $\frac{1}{2}$
Decl. +5° 7' $\frac{1}{2}$

1878.62	285.1	0.00	7.0...	12.5	1 ⁿ	β
1885.13	289.0	8.78	...	...	4 ⁿ	IIΣ
1893.66	290.0	8.90	7.2...	13.0	3 ⁿ	W
1896.71	287.0	8.76	7.5...	12.2	3 ⁿ	1 ⁿ
1898.68	288.2	8.90	7.0...	12.2	3 ⁿ	Λ

Discovered with the 18½-inch. Probably without change. Lalande 39230.

[β (x)...β...β...β (A. J. 407)...Wilson (...)...Aitken (358)...IIΣ (...)]

β 666. D.M. (18°) 2330

R.A. 20^h 18^m 5^s $\frac{1}{2}$
Decl. +5° 15' $\frac{1}{2}$

1877.58	191.4	1.7	8.8	11.0	1 ⁿ	β
1877.86	191.7	2.00	10.0	11.0	1 ⁿ	J
1892.85	191.0	1.88	11.0	11.5	1 ⁿ	Ho

Discovered with the 18½-inch.

[β (x)...β...β...β (18°) 2330]

6443. *Leptocarpus* sp. n.

Abstract

1998

300

1802.13	134.2	13.08	7.3	11.5	10	β
1802.20	133.4	13.00	—	—	16	O2
1802.81	133.2	13.16	7.3	12.0	20	W
1803.14	130.0	13.04	7.3	11.5	20	β

1. 1. 1.

0.075-0.17	17.3	15.22	12.0	1.0	β
0.075-0.21	22.0	18.18	10.5	2.0	W
0.075-0.25	26.2	15.47		2.0	β

Discovered with the 18½ inch. The 40-inch shows a faint star in the direction of B, which is nearer than C.

[β (VIII)... β (*Am. Jour. Sci.*, July 1877) ... β (*Ann. Chem. Phys.*, x)...Wilson (...)]

β 1134. D. 11. 10. 1918

1. A. $\frac{1}{2}$ and $\frac{1}{3}$

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

| 1980-1981 | 1981-1982 | 1982-1983 | 1983-1984 | 1984-1985 | 1985-1986 | 1986-1987 | 1987-1988 | 1988-1989 | 1989-1990 | 1990-1991 | 1991-1992 | 1992-1993 | 1993-1994 | 1994-1995 | 1995-1996 | 1996-1997 | 1997-1998 | 1998-1999 | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 | 2020-2021 | 2021-2022 | 2022-2023 | 2023-2024 | 2024-2025 | 2025-2026 | 2026-2027 | 2027-2028 | 2028-2029 | 2029-2030 | 2030-2031 | 2031-2032 | 2032-2033 | 2033-2034 | 2034-2035 | 2035-2036 | 2036-2037 | 2037-2038 | 2038-2039 | 2039-2040 | 2040-2041 | 2041-2042 | 2042-2043 | 2043-2044 | 2044-2045 | 2045-2046 | 2046-2047 | 2047-2048 | 2048-2049 | 2049-2050 | 2050-2051 | 2051-2052 | 2052-2053 | 2053-2054 | 2054-2055 | 2055-2056 | 2056-2057 | 2057-2058 | 2058-2059 | 2059-2060 | 2060-2061 | 2061-2062 | 2062-2063 | 2063-2064 | 2064-2065 | 2065-2066 | 2066-2067 | 2067-2068 | 2068-2069 | 2069-2070 | 2070-2071 | 2071-2072 | 2072-2073 | 2073-2074 | 2074-2075 | 2075-2076 | 2076-2077 | 2077-2078 | 2078-2079 | 2079-2080 | 2080-2081 | 2081-2082 | 2082-2083 | 2083-2084 | 2084-2085 | 2085-2086 | 2086-2087 | 2087-2088 | 2088-2089 | 2089-2090 | 2090-2091 | 2091-2092 | 2092-2093 | 2093-2094 | 2094-2095 | 2095-2096 | 2096-2097 | 2097-2098 | 2098-2099 | 2099-2100 | 2100-2101 | 2101-2102 | 2102-2103 | 2103-2104 | 2104-2105 | 2105-2106 | 2106-2107 | 2107-2108 | 2108-2109 | 2109-2110 | 2110-2111 | 2111-2112 | 2112-2113 | 2113-2114 | 2114-2115 | 2115-2116 | 2116-2117 | 2117-2118 | 2118-2119 | 2119-2120 | 2120-2121 | 2121-2122 | 2122-2123 | 2123-2124 | 2124-2125 | 2125-2126 | 2126-2127 | 2127-2128 | 2128-2129 | 2129-2130 | 2130-2131 | 2131-2132 | 2132-2133 | 2133-2134 | 2134-2135 | 2135-2136 | 2136-2137 | 2137-2138 | 2138-2139 | 2139-2140 | 2140-2141 | 2141-2142 | 2142-2143 | 2143-2144 | 2144-2145 | 2145-2146 | 2146-2147 | 2147-2148 | 2148-2149 | 2149-2150 | 2150-2151 | 2151-2152 | 2152-2153 | 2153-2154 | 2154-2155 | 2155-2156 | 2156-2157 | 2157-2158 | 2158-2159 | 2159-2160 | 2160-2161 | 2161-2162 | 2162-2163 | 2163-2164 | 2164-2165 | 2165-2166 | 2166-2167 | 2167-2168 | 2168-2169 | 2169-2170 | 2170-2171 | 2171-2172 | 2172-2173 | 2173-2174 | 2174-2175 | 2175-2176 | 2176-2177 | 2177-2178 | 2178-2179 | 2179-2180 | 2180-2181 | 2181-2182 | 2182-2183 | 2183-2184 | 2184-2185 | 2185-2186 | 2186-2187 | 2187-2188 | 2188-2189 | 2189-2190 | 2190-2191 | 2191-2192 | 2192-2193 | 2193-2194 | 2194-2195 | 2195-2196 | 2196-2197 | 2197-2198 | 2198-2199 | 2199-2200 | 2200-2201 | 2201-2202 | 2202-2203 | 2203-2204 | 2204-2205 | 2205-2206 | 2206-2207 | 2207-2208 | 2208-2209 | 2209-2210 | 2210-2211 | 2211-2212 | 2212-2213 | 2213-2214 | 2214-2215 | 2215-2216 | 2216-2217 | 2217-2218 | 2218-2219 | 2219-2220 | 2220-2221 | 2221-2222 | 2222-2223 | 2223-2224 | 2224-2225 | 2225-2226 | 2226-2227 | 2227-2228 | 2228-2229 | 2229-2230 | 2230-2231 | 2231-2232 | 2232-2233 | 2233-2234 | 2234-2235 | 2235-2236 | 2236-2237 | 2237-2238 | 2238-2239 | 2239-2240 | 2240-2241 | 2241-2242 | 2242-2243 | 2243-2244 | 2244-2245 | 2245-2246 | 2246-2247 | 2247-2248 | 2248-2249 | 2249-2250 | 2250-2251 | 2251-2252 | 22 |
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Discovered with the 36-inch. A naked-eye star in *Cepheus*, but not given as such by HEIS and ARGELANDER. The Harvard photometric magnitude is 5.8.

β 432. MV 185. 6.

1. *Journal of the American Medical Association*, 1997; 277: 1001-1005.

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|---------|-------|------|-------|-----|----|---|
| 1875.65 | 199.2 | 1.25 | 8.6.. | 9.9 | 20 | J |
| 1875.65 | 199.6 | 1.25 | 8.5.. | 9.7 | 19 | C |
| 1892.72 | 197.8 | 1.24 | 8.3.. | 9.7 | 20 | W |
| 1897.70 | 197.5 | 1.25 | — | — | 20 | H |
| 1895.60 | 198.5 | 1.24 | 8.4.. | 9.7 | 20 | A |

Documented with the search: Without relative change.

... Wilson (1958)... Aitken (1935)... Brown (1973)...

β 60. π (Columbini)

R. A. S. 2002, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059

1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 26

A and B

| | | | | | | |
|---------|-------|------|--------|------|----------------|-----|
| 1819.75 | 145.4 | 2.85 | 5.0... | 1.03 | 3 ^W | Mh |
| 1871.85 | 144.9 | 3.15 | 5.0... | 1.03 | 3 ^W | K |
| 1874.06 | 145.2 | 3.27 | 5.1... | 8.7 | 1 ^W | Jn |
| 1878.04 | 146.2 | 3.47 | 5.0... | 9.7 | 3 ^W | Cm |
| 1877.64 | 144.2 | 3.16 | 4.7... | 8.7 | 2 ^W | Cm |
| 1880.72 | 145.4 | 3.31 | | | 2 ^W | Pt |
| 1887.79 | 145.0 | 3.31 | 5.0... | 9.0 | 2 ^W | T |
| 1888.60 | 146.2 | 3.49 | 5.0... | 8.2 | 0 ^W | Lv |
| 1888.71 | 146.9 | 3.53 | 5.0... | 8.5 | 2 ^W | U |
| 1889.69 | 145.1 | 3.43 | 5.0... | 9 | 2 ^W | Il |
| 1887.74 | 146.5 | 3.45 | 4.9... | 7.3 | 2 ^W | See |
| 1898.51 | 144.2 | 3.43 | 5.0... | 7.8 | 3 ^W | D |
| 1898.56 | 144.2 | 3.43 | 5.0... | 7.8 | 2 ^W | D |

A and C ($\alpha = \beta = 2.00$)

| | | | | |
|---------|------|-------|-------|--------------|
| 1874 | 15.8 | 39.8 | 118.5 | β |
| 1898.56 | 43.5 | 38.12 | 111.0 | 2 <i>n</i> A |

The close pair was discovered with the 6-inch in 1874, but it had been seen long prior by MITCHELL at Cincinnati, although not published until 1876. The principal star has a proper motion of 0.017 in the direction of 313.2° (ATWERS). If the smaller star was fixed, the distance should increase about 0.8 in the time covered by the measures. The measures appear to indicate some change in this respect. The distant star was added with the Washington 26-inch.

...Cin³...Cin⁴...Pritchett (*Pub. Morrison Obsv.* 1)...
Tarrant (2899,2991)...Lv¹...Hall (11)...See [3496]...
Doddle (*Pub. Flower Obsv.* 1)...Aitken (3885)...

β 61, ρ (*Capricorn*)

E. A. M. J. van der Wal

1600-1605 18-19

A and C

| | | | | | |
|---------|-------|-------|---------|----|----|
| 1891.49 | 151.1 | 55.21 | ...13.2 | 3M | /h |
| 1898.63 | 151.3 | 55.19 | ...12.3 | 3M | 1 |
| 1899.44 | 151.1 | 55.32 | ...13.0 | 1M | /h |

A and B (= H¹ II. 51 = Sh 323)

| | | | | | | |
|---------|-------|------|-----|-----|------------|----|
| 1823.78 | 177.3 | 4.02 | 5 | 10 | 2 <i>m</i> | Sh |
| 1869.01 | 174.1 | 2.83 | 5.0 | 7.1 | 4 <i>m</i> | J |
| 1872.28 | 172.4 | 2.92 | | | 2 <i>m</i> | Sp |
| 1898.63 | 172.2 | 2.58 | | 7.5 | 3 <i>m</i> | D |

A and D (= H¹ VI. 29 = Sh 322)

| | | | | | | |
|---------|-------|--------|---|---|------------|---------|
| 1823.78 | 150.7 | 238.02 | 5 | 7 | 2 <i>m</i> | Sh |
| 1899.44 | 150.1 | 246.96 | | 7 | 1 <i>m</i> | β |

The faint star, C, was noted with the 6-inch. There are many measures of AB, which, taken together, do not show any sensible change. The principal star has a proper motion of 0".040 in the direction of 260° (AUWERS). It would appear from the measures that A and B are moving together. The very distant star, D, is Lalande 39364. The Cordoba meridian observations give for AD, 149".9 : 245".8.

[β (I)... β (*Mon. Not. XXXIII*, 351)... β (3111)... β (*Pub. I. O. II*) Doolittle (*Pub. Flower Obsy. I*)... Herschel (*Cape Obsy.*)... Mitchell (Cin²)... Jacob (*Mem. R. A. S. XVII*, XVIII)... Secchi (*Catalogo di 1321 Stelle Doppie*) (*Mem. Coll. Romano*, 1855)... Secchi (1017)... Knott (*Mon. R. A. S. XLIII*)... J (II)... Sp (III)... Pritchett (*Pub. Morrison Obsy. I*)... Cin³... Cin⁴... Tarrant (2899)... Lv²... LM ... Scott (*Brit. Ast. Ass. v*, 75; VI, 250)...

 β 62. Lalande 39445

R.A. 20^h 23^m 6^s *t*
Decl. + 20° 41' *t*

| | | | | | | |
|---------|-------|------|-----|-----|------------|---|
| 1875.52 | 135.5 | 1.20 | 8.5 | 9.4 | 4 <i>m</i> | J |
| 1892.59 | 137.6 | 1.21 | 8.2 | 9.8 | 2 <i>m</i> | W |
| 1898.54 | 136.2 | 1.16 | 8.1 | 9.2 | 3 <i>m</i> | D |

Discovered with the 6-inch.

[β (I)... β (*Mon. Not. XXXIII*, 351)... J (I)... Wilson ()... Doolittle (*Pub. Flower Obsy. I*)...]

 β 433. D.M. (55 1239)

R.A. 20^h 23^m 30^s *t*
Decl. + 55° 55' *t*

A and B

| | | | | | | |
|---------|-------|------|-----|------|------------|---|
| 1892.74 | 208.6 | 7.38 | 9.0 | 11.2 | 2 <i>m</i> | W |
| 1898.47 | 206.0 | 7.81 | 8.8 | 9.9 | 3 <i>m</i> | D |

A and C

| | | | | | |
|---------|-------|-------|------|------------|---|
| 1892.74 | 244.8 | 27.09 | 10.0 | 2 <i>m</i> | W |
| 1898.47 | 244.0 | 27.57 | 9.2 | 3 <i>m</i> | D |

Discovered with the 6-inch.

[AD (I)... β (2163)... Wilson ()... Doolittle (*Pub. Flower Obsy. I*)...]

 β 363. *Undulacae* 93

R.A. 20^h 24^m 28^s *t*
Decl. + 20° 12' *t*

| | | | | | | |
|---------|------|-------|-----|------|------------|---------|
| 1878.71 | 62.8 | 21.77 | 7.0 | 11.5 | 1 <i>m</i> | β |
| 1879.54 | 61.8 | 20.± | 7.0 | 12.0 | 1 <i>m</i> | Cin |
| 1892.68 | 65.4 | 19.72 | 7.2 | 12.2 | 2 <i>m</i> | W |

Discovered with the 6-inch. WILSON measures at third star, 197".5 : 44".14 (1892.68) 2*m*. The principal star is W² XX, 807.

[β (VI)... β (2062)... β ... Cin⁵... Wilson ()...]

 β 63. *Delphini*

R.A. 20^h 24^m 33^s *t*
Decl. + 10° 30' *t*

A and B

| | | | | | | |
|---------|-------|------|-----|-----|------------|------------|
| 1874.70 | 350.0 | 0.64 | | | 4 <i>m</i> | N |
| 1874.92 | 343.3 | 0.84 | 6.0 | 8.0 | 4 <i>m</i> | J |
| 1878.46 | 345.0 | | 6.0 | 8.0 | 4 <i>m</i> | β |
| 1878.60 | 338.9 | 0.85 | 6.5 | 8.5 | 1 <i>m</i> | OX |
| 1879.70 | 344.9 | 0.67 | | | 1 <i>m</i> | β |
| 1880.19 | 345.4 | 0.88 | 6.4 | 7.9 | 3 <i>m</i> | β |
| 1884.97 | 346.6 | 0.91 | | | 3 <i>m</i> | H Σ |
| 1887.60 | 344.8 | 0.59 | 6.0 | 8.0 | 3 <i>m</i> | I |
| 1887.84 | 347.4 | 0.79 | 6 | 10 | 2 <i>m</i> | HI |
| 1888.59 | 347.0 | 0.80 | 5.6 | 8.0 | 3 <i>m</i> | Lv |
| 1888.62 | 347.9 | 0.67 | | | 8 <i>m</i> | Sp |
| 1888.69 | 340.1 | 0.88 | 6.0 | 8.0 | 2 <i>m</i> | T |
| 1891.69 | 353.3 | 1.06 | | | 2 <i>m</i> | Maw |
| 1897.82 | 349.5 | 1.11 | | | 2 <i>m</i> | Br |
| 1898.48 | 343.6 | 0.93 | 7.3 | 8.3 | 2 <i>m</i> | D |
| 1898.64 | 346.7 | 0.88 | 6.1 | 8.5 | 2 <i>m</i> | β |
| 1898.70 | 344.8 | 1.14 | 6.0 | 8.0 | 4 <i>m</i> | A |
| 1898.85 | 353.9 | 0.94 | | | 1 <i>m</i> | Maw |

A and C (= S 247)

| | | | | | |
|---------|-------|-------|------|------------|------------|
| 1874 | 300 | 1.5 | 13.5 | | β |
| 1885.60 | 349.8 | 16.71 | | | H Σ |
| 1898.48 | 352.7 | 13.81 | 13.5 | 1 <i>m</i> | D |
| 1898.55 | 346.6 | 10.75 | 14.2 | 2 <i>m</i> | β |
| 1898.79 | 346.6 | 17.77 | 13.3 | 3 <i>m</i> | A |

The close pair was discovered with the 6-inch, and the distant star added with the Washington 26-inch. So far there appears to be no sensible change in AB. The proper motion of the principal star is very small— 0.0114 in the direction of 345.0 . If this is substantially correct as to amount, the components are moving together, as otherwise the distance would be increased nearly 0.3 in the time covered by the measures.

(4) ... *Mem. Trans. ...* ... *Newcomb (H. ...)*
 (1871, 1881, 1888, 1902) ... *Profrance (G. ...)*
 X) ... Tarrant (2899, 2901) ... Lv ... Hall (II) ... Sp (III)
 ... Maw (*Mem. R. A. S. L.*, 1311) ... Doolittle (*Pub. Flower Obs.*, 1) ... Aitken (3385) ... Brown () ...]

β 987. Latitude 3050'

R.A. $20^h 23^m 20^s$ t
 Decl. $-48^\circ 33'$ λ

Visual B

| | | | | | |
|---------|------|------|--------------|----------------|---------|
| 1878.65 | 27.7 | 2.32 | 7.2 ... 11.5 | 3 ^u | β |
| 1893.57 | 28.2 | 2.40 | 7.5 ... 11.7 | 3 ^u | W |

A and C (= S 752)

| | | | | | | |
|---------|-------|--------|---|-----|----------------|---------|
| 1824.98 | 288.6 | 105.38 | 7 | 7.2 | 3 ^u | S |
| 1879.99 | 288.5 | 106.17 | | 7.2 | 2 ^u | β |

The close companion to A was discovered with the 18½-inch. The foregoing are all the measures of AC. The *Berlin A. G. Catalogue* gives the proper motion of the principal star 0.041 in the direction of 290.1 .

(4) ... *Mem. Trans. ...* ...]

β 1135. Latitude 3250'

R.A. $20^h 23^m 20^s$ t
 Decl. $-48^\circ 33'$ λ

| | | | | | |
|---------|-------|------|--------------|----------------|---|
| 1878.65 | 336.8 | 1.40 | 8.1 ... 11.4 | 3 ^u | A |
| 1897.78 | 340.4 | 1.56 | ... | 1 ^u | A |

Discovered with the 12-inch.

β (XVI) ... β (2956) ... β (*Pub. L. O. II*) ... Aitken (*A. J.*, 429)
 (*Act. Soc. Pac.*, VII, 405) ...]

β 668. B.A.C. 7080

R.A. $20^h 28^m 40^s$ t
 Decl. $-10^\circ 10'$ λ

| | | | | | |
|---------|------|------|--------------|----------------|---------|
| 1878.63 | 29.0 | 4.04 | 6.2 ... 11.7 | 3 ^u | β |
| 1881.67 | 26.1 | 4.99 | 6.5 ... 12.4 | 4 ^u | β |
| 1890.57 | 25.0 | 4.80 | 6.8 ... 11.2 | 3 ^u | β |
| 1891.49 | 27.8 | 4.64 | 6.9 ... 11.5 | 3 ^u | β |
| 1898.56 | 27.3 | 4.75 | 6.5 ... 12.0 | 2 ^u | β |
| 1898.57 | 25.6 | 4.06 | 6.9 ... 12.2 | 3 ^u | A |
| 1898.70 | 26.3 | 4.00 | 6.7 ... 11.3 | 4 ^u | D |

Discovered with the 18½-inch. A very interesting physical system from the considerable proper motion of the components. This motion of the principal star is given:

| | | | |
|--------|---|---|---------------|
| Bonn | - | - | 0.309 in 67.7 |
| Auwers | - | - | 0.309 in 72.1 |
| Porter | - | - | 0.305 in 66.2 |

There has been very little, if any, change in the position of the small star in twenty years. This is a naked-eye star in *Capricornus*. The Harvard photometric magnitude is 5.6.

[β (X) ... β ... β (3048, 3114) ... β (*Pub. L. O. II*) ...]
 Aitken (3385) ... Doolittle (*Pub. Flower Obs.*, 1) ...]

β 669. ω^2 Cygni

R.A. $20^h 29^m 20^s$ t
 Decl. $+48^\circ 33'$ λ

A and B

| | | | | | |
|---------|-------|-------|--------------|----------------|---------|
| 1878.65 | 342.5 | 17.26 | 5.5 ... 13.5 | 1 ^u | β |
| 1898.51 | 342.2 | 18.11 | ... | 3 ^u | β |

A and C

| | | | | | | |
|---------|------|-------|-----|------|----------------|---------|
| 1878.65 | 86.3 | 56.28 | ... | 10.0 | 1 ^u | β |
| 1893.65 | 86.6 | 55.86 | ... | 10.0 | 4 ^u | W |
| 1898.49 | 86.5 | 56.02 | ... | 8.7 | 2 ^u | D |
| 1898.51 | 86.3 | 56.39 | ... | ... | 3 ^u | β |

These distant companions were noted with the 18½-inch. AUWERS gives the proper motion 0.042 in the direction of 160.8 . This would increase the distance of B in twenty years about 0.8 , and this change is shown by the measures.

[β (X) ... β ... Wilson () ... Doolittle (*Pub. Flower Obs.*, 1) ...]

β 670. D.M. 113 14435R.A. $20^h 27^m 17^s$ t
Decl. $+13^\circ 42' 5''$

| | | | | | | |
|---------|------|-----------|--------|-----|-------|---------|
| 1877.75 | 58.3 | 0.76 | 8.5... | 8.8 | 2 u | β |
| 1877.83 | 53.5 | 0.63 | 8.5 | 9.0 | 1 u | J |
| 1889.87 | 50.7 | 0.6 \pm | ... | ... | 5 u | Sp |
| 1893.51 | 47.3 | 0.53 | 8.5... | 8.9 | 3 u | Lv |
| 1896.12 | 44.8 | 0.62 | 8.2... | 9.2 | 2 u | W |
| 1897.84 | 48.4 | 0.45 | ... | ... | 2 u | Br |
| 1898.75 | 47.1 | 0.57 | 8.7... | 9.2 | 3 u | A |

Discovered with the 18½-inch. The measures suggest angular motion. The southern star of a wide pair.

[β (X)... β ...J (1)...Sp (III)...Lv (A. J. 382)...Aitken (3585)...Wilson ()...Brown ()...]

 β 434. W² XX. 941R.A. $20^h 28^m 5^s$ t
Decl. $-41^\circ 28' 5''$

| | | | | | | |
|---------|-------|------|--------|-----|-------|---|
| 1877.29 | 101.1 | 1.37 | 9.1... | 9.9 | 3 u | J |
| 1892.70 | 100.8 | 1.56 | 9.0... | 9.8 | 2 u | W |

Discovered with the 6-inch.

[β (VII)... β (2103)...A (1)...Wilson ()...]

 β 1136. Lalande 36608R.A. $20^h 28^m 6^s$ t
Decl. $+40^\circ 8' 5''$

| | | | | | | |
|---------|-------|------|--------|-----|-------|---------|
| 1889.54 | 206.6 | 0.35 | 8.1... | 9.7 | 3 u | β |
|---------|-------|------|--------|-----|-------|---------|

Discovered with the 12-inch. Recent measures are wanting.

[β (XXVI)... β (2956)... β (Zoe. I. C. 11) ...]

 β 1208. Lalande 36656R.A. $20^h 28^m 48^s$ t
Decl. $+6^\circ 28' 5''$

| | | | | | | |
|---------|-------|------|--------|------|-------|---------|
| 1890.55 | 335.5 | 2.04 | 7.4... | 12.2 | 3 u | β |
| 1897.80 | 333.0 | 3.12 | ... | ... | 1 u | Br |
| 1899.45 | 330.8 | 3.02 | 7.2... | 13.0 | 2 u | A |

Discovered with the 36-inch.

[β (XXVII)... β (3047)... β (Zoe. I. C. 11) ...Brown ()...Aitken ()...]

 β 671. O. Arg. N. 20741R.A. $20^h 26^m 33^s$ t
Decl. $+62^\circ 3' 5''$

| | | | | | | |
|---------|-------|-----------|--------|------|-------|-------------|
| 1877.57 | 334.8 | 0.5 | 8.0... | 10.0 | 1 u | β |
| 1877.78 | 335.9 | 0.47 | 8.0... | 8.5 | 1 u | J |
| 1879.49 | 333.9 | 0.42 | 7.5... | 9.0 | 1 u | β |
| 1881.57 | 333.2 | 0.49 | 8.0... | 11.5 | 1 u | β |
| 1885.53 | 337.0 | 0.6 \pm | ... | ... | 1 u | 11 Σ |
| 1898.65 | 330.0 | 0.49 | 7.9... | 8.7 | 2 u | D |

Discovered with the 18½-inch. No certain change.

[β (X)... β ... β ...J (1)...Doodittle (Zoe. I. C. 11) ...H Σ ()...]

 β 151. β DelphinR.A. $20^h 31^m 55^s$ t
Decl. $+14^\circ 11' 5''$

A and B

| | | | | | | |
|---------|-----------|-------|--------|-----|-------|-------------|
| 1873.60 | 355 \pm | 0.7 | ... | ... | ... | β |
| 1874.60 | 15.5 | 0.65 | 4.1... | 5.4 | 5 u | J |
| ... | 7.0 | 0.49 | ... | ... | 3 u | New |
| ... | .73 | 0.69 | 3.5... | 4.5 | 1 u | O Σ |
| 1875.61 | 14.7 | 0.42 | 4.0... | 6.0 | 4 u | Sp |
| ... | .65 | 0.54 | 4.3... | 6.7 | 4 u | J |
| 1876.65 | 25.8 | 0.48 | 4.1... | 6.3 | 4 u | J |
| ... | .85 | obl. | ... | ... | 1 u | O Σ |
| 1877.27 | 17.7 | 0.35 | ... | ... | 2 u | Sp |
| ... | .71 | 0.51 | 4.6... | 5.0 | 5 u | J |
| ... | .79 | 0.32 | ... | ... | 2 u | β |
| 1878.65 | 53.7 | 0.24 | ... | ... | 4 u | β |
| ... | .75 | 59.2 | ... | ... | 1 u | J |
| 1880.68 | 133.6 | 0.26 | ... | ... | 3 u | β |
| ... | .75 | 214.5 | 8.2 | ... | 2 u | 11 Σ |
| 1881.54 | 149.2 | 0.20 | ... | ... | 5 u | β |
| ... | .88 | 151.7 | ... | ... | 1 u | Big |
| 1882.60 | 167.5 | 0.20 | ... | ... | 3 u | β |
| 1883.25 | 183.9 | 0.19 | ... | ... | 7 u | En |
| ... | .55 | 182.3 | 0.23 | ... | 3 u | β |
| 1884.69 | 195.9 | 0.32 | ... | ... | 3 u | 11 Σ |
| ... | .71 | 197.7 | 0.32 | ... | 4 u | 1 Σ |
| ... | .77 | 199.2 | 0.20 | ... | 5 u | β |
| 1885.61 | 222.9 | 0.4 | ... | ... | 1 u | 11 Σ |
| ... | .75 | 206.2 | ... | ... | 2 u | 11 Σ |
| ... | .91 | 216.6 | 0.38 | ... | 8 u | En |
| 1886.77 | 257.8 | ... | ... | ... | 1 u | 11 Σ |
| ... | .88 | 233.1 | 0.23 | ... | 7 u | Sp |

| | | | | |
|---------|-------|------|-----------------|----------------|
| 1879.41 | 278.5 | 0.3 | 4 ⁿ | Ho |
| 1879.41 | 278.5 | 0.3 | 5 ⁿ | Sp |
| 1879.41 | 278.5 | 0.30 | 2 ⁿ | T |
| 1879.41 | 272.0 | 0.41 | 3 ⁿ | H Σ |
| 1879.41 | 272.0 | 0.4 | 15 | H α |
| 1879.41 | 287.8 | 0.25 | 8 ⁿ | Sp |
| 1888.65 | 306.1 | 0.20 | 7 ⁿ | β |
| 1888.65 | 300.0 | 0.34 | 3 ⁿ | H Σ |
| 1888.65 | 311.5 | 0.25 | 7 ⁿ | Sp |
| 1888.65 | 311.5 | 0.31 | 25 | β |
| 1888.65 | 311.5 | 0.34 | 6 ⁿ | H Σ |
| 1888.65 | 311.5 | 0.31 | 100 | Sp |
| 1888.65 | 314.2 | 0.45 | 1 ⁿ | β |
| 1888.65 | 314.2 | 0.43 | 25 | Sp |
| 1888.65 | 314.2 | 0.38 | 4 ⁿ | β |
| 1888.65 | 318.1 | 0.79 | 14 | See |
| 1888.65 | 318.1 | 0.30 | 3 ⁿ | H Σ |
| 1888.65 | 318.1 | 0.47 | 3 ⁿ | H Σ |
| 1888.65 | 318.1 | — | 16 | Big |
| 1888.65 | 333.5 | 0.46 | 6 ⁿ | Sp |
| 1888.65 | 318.7 | 0.50 | 4 ⁿ | β |
| 1888.65 | 318.7 | 0.49 | 2 ⁿ | Bar |
| 1888.65 | 318.7 | 0.54 | 5 ⁿ | Sp |
| 1893.52 | 310.2 | 0.38 | 4 ⁿ | 1 ⁿ |
| 1893.52 | 310.2 | 0.75 | 5 ⁿ | 2 ⁿ |
| 1893.52 | 335.3 | 0.57 | 3 ⁿ | Ho |
| 1893.52 | 335.3 | 0.56 | 5 ⁿ | Bar |
| 1893.52 | 346.8 | 0.51 | 3 ⁿ | Com |
| 1893.52 | 346.8 | 0.51 | 18 ⁿ | Sp |
| 1893.52 | 346.8 | — | 16 | Big |
| 1893.52 | 346.8 | — | 2 ⁿ | Bar |
| 1894.51 | 349.4 | 0.56 | 1 ⁿ | H Σ |
| 1894.51 | 345.9 | 0.62 | 1 ⁿ | Sp |
| 1894.51 | 347.4 | 0.50 | 1 ⁿ | See |
| 1894.51 | 351.8 | 0.49 | 6 ⁿ | Bar |
| 1894.51 | 349.7 | 0.68 | 5 ⁿ | Ho |
| 1894.51 | 349.7 | 0.54 | 3 ⁿ | Com |
| 1894.51 | 349.7 | 0.58 | 2 ⁿ | Dy |
| 1894.51 | 349.7 | 0.66 | 3 ⁿ | Sp |
| 1894.51 | 349.7 | 0.67 | 1 ⁿ | Lew |
| 1894.51 | 349.7 | 0.65 | 1 ⁿ | Br |
| 1894.51 | 361.8 | 0.45 | 1 ⁿ | See |
| 1894.51 | 361.8 | 0.50 | 3 ⁿ | Com |
| 1894.51 | 361.8 | 0.51 | 3 ⁿ | See |
| 1894.51 | 361.8 | 0.67 | 1 ⁿ | A |
| 1894.51 | 361.8 | 0.49 | 1 ⁿ | Hu |
| 1894.51 | 361.8 | 0.60 | 1 ⁿ | Sp |
| 1894.51 | 361.8 | 0.65 | 2 ⁿ | See |
| 1894.51 | 361.8 | 0.84 | 3 ⁿ | Bar |
| 1894.51 | 361.8 | 0.84 | 3 ⁿ | A |

| | | | | |
|---------|-------|------|----------------|---------|
| 1897.64 | 357.3 | 0.71 | 1 ⁿ | Hu |
| 1897.64 | 357.3 | 0.55 | 1 ⁿ | Maw |
| 1897.64 | 357.3 | 0.70 | 3 ⁿ | D |
| 1897.64 | 357.3 | 0.62 | 1 ⁿ | Dob |
| 1897.64 | 357.3 | 0.65 | 1 ⁿ | See |
| 1897.64 | 357.3 | 0.62 | 4 ⁿ | Sp |
| 1897.64 | 357.3 | 0.63 | 1 ⁿ | Br |
| 1897.64 | 357.3 | 0.64 | 3 ⁿ | A |
| 1897.64 | 357.3 | 0.67 | 4 ⁿ | β |
| 1897.64 | 357.3 | 0.62 | 7 ⁿ | Hu |
| 1897.64 | 357.3 | 0.70 | 1 ⁿ | D |
| 1897.64 | 357.3 | 0.55 | 2 ⁿ | Br |
| 1897.64 | 357.3 | 0.66 | 1 ⁿ | Lew |
| 1897.64 | 357.3 | 0.57 | 5 ⁿ | Sp |

AB and C (= Herschel)

| | | | | | |
|---------|-------|-------|------|----------------|----------------|
| 1828 | 107.7 | 18.7 | 14 | 1 ⁿ | H ⁺ |
| 1878.45 | 110.2 | 27.66 | | 3 ⁿ | β |
| 1881.19 | 115.6 | 27.57 | 12.7 | 4 ⁿ | β |
| 1883.54 | 110.2 | 27.43 | | 1 ⁿ | β |
| 1888.82 | 115.7 | 26.77 | | 2 ⁿ | β |
| 1890.46 | 117.3 | 26.89 | | 3 ⁿ | β |
| 1895.81 | 117.8 | 26.14 | | 1 ⁿ | Lew |
| 1898.49 | 117.6 | 25.87 | | 3 ⁿ | β |
| 1898.59 | 117.1 | 25.92 | | 2 ⁿ | Bar |

AB and D C (= H Σ IV, 35 2791)

| | | | | | |
|---------|-------|-------|-----------|----------------|----------|
| 1829.40 | 343.8 | 32.48 | 3.0, 11.0 | 3 ⁿ | Σ |
| 1851.84 | 339.2 | 33.74 | 11.0 | 2 ⁿ | Σ |
| 1864.94 | 336.6 | 34.64 | 16.3 | 3 ⁿ | J |
| 1888.82 | 333.2 | 36.35 | — | 2 ⁿ | β |
| 1898.49 | 331.4 | 37.18 | — | 3 ⁿ | β |
| 1898.71 | 332.3 | 36.98 | — | 1 ⁿ | Bar |

The close pair, AB, was discovered with the 6-inch in August 1873. It was evident at this time that it would prove to be a binary system, as otherwise it could not have escaped detection by prior observers. It has now (1899) completed substantially one revolution since it was discovered. The following orbits have been computed, the first column giving the date of the last measures used:

| | | | | |
|------|----------|-------|------|---------------------------|
| 1883 | Doublago | 26.07 | 1883 | A. N. 2602 |
| 1884 | Gore | 30.91 | 1884 | Proc. R. I. Ac. IV, No. 5 |
| 1887 | Celoria | 16.95 | 1887 | A. N. 2824 |
| 1890 | Burnham | 28.5 | 1890 | Sid. Mess. X, 215 |
| 1892 | Glazenap | 22.97 | 1892 | A. N. 3177 |
| 1895 | See | 27.66 | 1895 | Evolution Binary Systems |
| 1899 | Brindley | 26.70 | 1899 | (This volume) |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The angle in the measure in β^2 is erroneously printed 151°9, the correction for parallel not having been applied. It should be as given above. There is no change in the components. This pair and H 921, which is 5' 7", form a wide quadruple.

[β (VII)... β (2103)... β^2 ...Cin⁵...Cin⁶...Wilson (Cin¹⁶)...
Tarrant (3186)...Boothroyd ()...]

β 673. D.M. (20°) 4680

R.A. 20^h 30^m 26^s t
Decl. + 20° 17' λ

| | | | | | |
|---------|-------|------|------------|------------|------------|
| 1878.78 | 298.1 | 4.10 | 7.3...11.8 | 2 <i>n</i> | β |
| 1884.62 | 294.3 | 4.00 | ... | 2 <i>n</i> | H Σ |
| 1893.66 | 298.3 | 3.71 | 7.2...11.5 | 3 <i>n</i> | W |
| 1898.67 | 295.6 | 3.89 | 7.5...11.1 | 3 <i>n</i> | D |

Discovered with the 18½-inch. The *n* star of a wide pair, the other being D.M. (20°) 4682, 1^h.9 *f* and 1' 7 s.

[β (X)... β^2 ...Wilson ()...Doolittle (*Pub. Flower. Obs.* 1)
...H Σ ()...]

β 674. Varnall 19020

R.A. 20^h 37^m 53^s t
Decl. + 21° 19' λ

| | | | | | |
|---------|-------|------|------------|------------|--------------|
| 1877.51 | 126 + | 1.32 | 8.0...10.5 | 1 <i>n</i> | β |
| 1879.78 | 103.4 | 1.35 | 8.0...10.8 | 1 <i>n</i> | Cin |
| 1892.79 | 99.9 | 1.19 | 8.0...11.0 | 1 <i>n</i> | Ho |
| 1897.80 | 103.1 | 1.69 | 7...9.8 | 1 <i>n</i> | See |
| 1898.67 | 100.9 | 1.46 | 7.9...9.5 | 4 <i>n</i> | D |
| 1898.67 | 102.8 | 1.59 | 7.2...9.7 | 3 <i>n</i> | C ϵ |

Discovered with the 18½-inch.

[β (X)... β^2 ...Cin⁶...Hough (3234)...See (3490)...Doolittle
(*Pub. Flower. Obs.* 1)...Cogshall ()...]

β 675. 51 Cygni

R.A. 20^h 38^m 34^s t
Decl. + 40° 34' λ

A and B

| | | | | | |
|---------|-------|------|------------|------------|------------|
| 1878.24 | 101.5 | 2.78 | 6.0...13.5 | 3 <i>n</i> | β |
| 1885.54 | 103.4 | 3.25 | ... | 2 <i>n</i> | H Σ |
| 1889.45 | 101.5 | 2.99 | 5.0...13.2 | 3 <i>n</i> | β |
| 1898.63 | 102.3 | 3.19 | 6.2...13.2 | 3 <i>n</i> | A |

A and C

| | | | | | |
|---------|-------|-------|---------|------------|---------|
| 1878.39 | 182.4 | 25.39 | ...12.6 | 1 <i>n</i> | β |
| 1898.60 | 182.5 | 25.94 | ...12.5 | 3 <i>n</i> | A |

A and D

| | | | | | |
|---------|-------|-------|---------|------------|---------|
| 1878.39 | 328.1 | 32.85 | ...12.6 | 1 <i>n</i> | β |
| 1898.60 | 328.9 | 33.43 | ...12.6 | 3 <i>n</i> | A |

Discovered with the 18½-inch. The large star has a proper motion of 0.031 in the direction of 93°7 (AUWERS). As this is nearly in the direction of B, its distance, if fixed, should decrease annually by that amount. This movement of A during the time covered by the measures would be 0.6. The observations tend to show an increasing distance, and it is probable that the two stars form a physical system.

[β (X)... β^2 ... β (2957)... β (*Pub. L. O. II*)...H Σ ()...
Atken (3585)...]

β 64. W² XX. 977

R.A. 20^h 47^m 18^s t
Decl. + 12° 17' λ

A and B

| | | | | | |
|---------|-------|------|-----------|------------|---------|
| 1876.20 | 172.4 | 0.63 | 8.7...9.6 | 5 <i>n</i> | J |
| 1882.68 | 193.0 | 0.50 | ... | 1 <i>n</i> | Procy |
| 1891.84 | 180.3 | 0.65 | 8.3...8.4 | 4 <i>n</i> | β |
| 1894.16 | 187.9 | 0.50 | ... | 3 <i>n</i> | Sp |
| 1897.57 | 183.8 | 0.57 | ... | 1 <i>n</i> | Row |
| 1897.82 | 186.3 | 0.49 | ... | 1 <i>n</i> | Dy |
| 1897.83 | 186.9 | 0.55 | ... | 1 <i>n</i> | Br |
| 1898.71 | 184.0 | 0.61 | 7.5...7.5 | 3 <i>n</i> | A |
| 1898.75 | 188.6 | 0.53 | ... | 1 <i>n</i> | Low |

AB and C (0.025 A.p. 12.20)

| | | | | | | |
|---------|-------|-------|--------|-----|------------|---------|
| 1874.67 | 158.6 | 06.40 | 7.1 | 7.3 | 3 <i>n</i> | J |
| 1894.84 | 158.1 | 06.45 | | 8.2 | 3 <i>n</i> | β |
| 1898.68 | 157.8 | 06.60 | 7.2... | 7.5 | 2 <i>n</i> | A |

The close pair was discovered with the 9.4-inch of the Dartmouth College Observatory. There appears to be slow direct motion in angle. The measures show no change in the distant star C. All the observations of this are given. There is a small star nearer AB, which has been measured from the close pair as follows:

| | | | | | |
|---------|-------|-------|------|------------|---------|
| 1874.25 | 146.3 | | 10.7 | 1 <i>n</i> | J |
| 1894.84 | 148.9 | 02.22 | 10.5 | 2 <i>n</i> | β |

[18 (11) ... *Mon. Not. XXXIV*, 59.] ... *Cin* ... Wilson
(*Cin*¹⁰) ... Sellors (3303) ... See (3496) ... See () ...
Doolittle (*Pub. Flower Obs.*, 1) ... Scott (*Mon. Not.* LIX,
427) ...]

β 152. *Lalande 10166*

R.A. 20^h 39^m 18^s *l*
Decl. + 28° 31' *l*

| | | | | | | |
|---------|-------|------|--------|------|----|-----|
| 1875.61 | 282.2 | 2.4 | 7.5... | 9.0 | 10 | Cin |
| 1878.53 | 282.2 | 2.4 | 7.0... | 9.0 | 10 | Cin |
| 1885.57 | 286.0 | 1.6 | 7.0... | 9.0 | 20 | W |
| 1889.40 | 285.5 | 0.60 | 7.0... | 10.0 | 10 | W |
| 1899.68 | 286.0 | 0.50 | 7.1... | 9.8 | 10 | See |
| 1898.68 | 283.6 | 0.67 | 7.5... | 9.0 | 30 | A |

Discovered with the 6-inch. There may be some change in the angle. This is Radcliffe 4932.

[18 (11) ... *Mon. Not. XXXIV*, 59.] ... *J* (1) ... *J* (2886)
... Sp (11) ... Aitken (3585) ... H Σ () ... Brown

β 834. *B.A.C. 7187*

R.A. 20^h 39^m 18^s *l*
Decl. + 28° 31' *l*

| | | | | | | |
|---------|-------|------|--------|------|----|------|
| 1881.58 | 282.2 | 2.44 | 8.5... | 11.0 | 00 | β |
| 1886.86 | 281.7 | 1.97 | 8.5... | 11.0 | 40 | U.L. |
| 1897.01 | 283.3 | 2.14 | 8.3... | 11.0 | 30 | Com |
| 1898.68 | 283.6 | 2.41 | 8.9... | 10.5 | 10 | D |

Discovered with the 15½-inch at the Washburn Observatory.

[18 (11) ... *Mon. Not. XXXIV*, 59.] ... *Pub. Washburn Obs.*,
v) ... Comstock (*Pub. Washburn Obs.*, vi) ... Doolittle
(*Pub. Flower Obs.*, 1) ...]

β 153. *B.A.C. 7187*

R.A. 20^h 39^m 18^s *l*
Decl. + 28° 31' *l*

| | | | | | | |
|---------|-------|------|--------|------|----|-----|
| 1875.61 | 282.2 | 2.4 | 7.5... | 9.0 | 10 | Cin |
| 1877.70 | 282.7 | 1.3 | 7.0... | 9.5 | 10 | Cin |
| 1882.62 | 286.0 | 1.6 | 7.7... | 9.0 | 20 | W |
| 1885.57 | 285.5 | 0.6 | 7.0... | 10.0 | 10 | W |
| 1899.68 | 286.0 | 0.59 | 7.1... | 9.8 | 10 | See |
| 1896.83 | 286.0 | 1.49 | 6.5... | 11.0 | 20 | See |
| 1897.68 | 283.3 | 2.14 | 8.3... | 11.0 | 30 | Sc |
| 1897.74 | 284.1 | 1.66 | 7.1... | 9.8 | 10 | See |
| 1898.68 | 274.1 | 1.3 | 7.1... | 9.8 | 10 | D |

Discovered with the 6-inch.

β 471. *D.M. (61) 2040*

R.A. 20^h 41^m 21^s *l*
Decl. + 33° 31' *l*

| | | | | | | |
|---------|-------|------|---------|------|----|---|
| 1876.72 | 305.9 | 1.40 | 10.0... | 10.0 | 10 | J |
| 1893.70 | 308.0 | 1.97 | 10.0... | 10.3 | 30 | W |
| 1898.45 | 307.0 | 1.78 | 10.3... | 10.9 | 30 | D |

Discovered with the 6-inch.

[18 (11) ... *B. M. N. XXXVIII*, 78] ... *J* (1) ... Wilson ()
... Doolittle (*Pub. Flower Obs.*, 1) ...]

β 676. *ε Cygni*

R.A. 20^h 41^m 21^s *l*
Decl. + 33° 31' *l*

| | | | | | | |
|---------|-------|-------|------|------|----|------------|
| 1852.63 | 338.8 | 40.09 | 2... | 12 | 10 | O Σ |
| 1861.63 | 332.0 | 39.64 | 2... | 12.5 | 10 | O Σ |
| 1878.08 | 320.9 | 37.72 | 3... | 12 | 20 | β |
| 1883.60 | 310.5 | 38.66 | ... | 12 | 20 | H Σ |
| 1891.52 | 310.3 | 38.68 | ... | 13 | 30 | β |
| 1898.31 | 305.3 | 39.22 | ... | 12.5 | 20 | β |
| 1898.59 | 305.2 | 39.14 | ... | 12.0 | 30 | A |
| 1898.67 | 301.3 | 39.64 | ... | 12.0 | 30 | D |

Discovered with the 18½-inch. The large star has a considerable proper motion, 0.481 in the direction of 46°5 (AUWERS). This corresponds with substantial exactness to the displacement of the companion shown by the measures. The small star had been seen by O Σ as appears by his observations published long after his *Tenth Catalogue*.

[18 (11) ... *B. M. N. XXXIV*, 59.] ... *Pub. L. O. 11* ... O Σ (*Poulton Obs.*, x) ... Aitken (3585) ... Doolittle (*Pub. Flower Obs.*, 1) ...]

β 364. *Lalande 10166*

R.A. 20^h 41^m 52^s *l*
Decl. + 24° 58' *l*

| | | | | | | |
|---------|-------|------|--------|-----|----|----|
| 1876.17 | 219.4 | 1.56 | 8.7... | 8.9 | 40 | J |
| 1892.75 | 226.5 | 1.25 | 8.7... | 8.7 | 20 | Ho |
| 1897.61 | 223.3 | 1.31 | 8.5... | 8.7 | 30 | D |

Discovered with the 6-inch. In a low power field with 30 *Vulpeculae*.

[18 (11) ... *B. M. N. XXXIV*, 59.] ... *Hough* (3243) ... Doolittle (*Pub. Flower Obs.*, 1) ...]

β 65. 13 *Delphini*R.A. 20^h 41^m 52^s *l*
Decl. + 5° 34' *λ*

| | | | | | | |
|---------|-------|------|--------|------|----------------|-----|
| 1875.44 | 186.4 | 1.61 | 5.2... | 8.8 | 4 ⁿ | J |
| 1876.85 | 178.6 | 1.42 | 6.0... | 10.0 | 1 ⁿ | OΣ |
| 1878.47 | 186.3 | 1.72 | 5.2... | 9.0 | 3 ⁿ | Sp |
| 1884.62 | 187.3 | 1.76 | ... | ... | 2 ⁿ | HΣ |
| 1887.40 | 188.8 | 1.59 | 5.2... | 9.0 | 4 ⁿ | T |
| 1888.65 | 186.8 | 1.49 | 5.0... | 9.2 | 1 ⁿ | Lv |
| 1888.70 | 187.1 | 1.54 | ... | ... | 2 ⁿ | T |
| 1895.62 | 189.7 | 1.41 | ... | ... | 3 ⁿ | Col |
| 1897.84 | 188.4 | 1.48 | ... | ... | 2 ⁿ | Br |
| 1898.62 | 189.1 | 1.42 | 6.4... | 7.7 | 3 ⁿ | D |

Discovered with the 6-inch. The measures do not show any material relative change. The proper motion of this star is very small, of the direction of 264.5 (AUWERS).

[β (1)...β (*Mon. Not.* XXXIII, 351)...*d* (1)...*d* (2081)...HΣ ()...OΣ (*Poulkova Obsns.* X)...Sp (11)...Tarrant (2866)...Lv¹...Doolittle (*Pub. Flower Obsy.* 1)...Brown ()...Coleman (*Mem. R. A. S. LIII*)...]

β 677. T *Cygni*R.A. 20^h 42^m 23^s *l*
Decl. + 53° 50' *λ*

A and B

| | | | | | | |
|---------|-------|-------|--------|------|----------------|----|
| 1878.41 | 121.3 | 9.66 | 7.0... | 12.0 | 1 ⁿ | β |
| 1881.71 | 119.8 | 9.65 | 6.0... | 11.7 | 3 ⁿ | Ho |
| 1885.55 | 117.7 | 10.15 | ... | ... | 1 ⁿ | HΣ |
| 1890.52 | 120.9 | 9.91 | 5.6... | 12.2 | 3 ⁿ | β |
| 1898.31 | 120.7 | 9.88 | 6.0... | 12.0 | 2 ⁿ | β |

A and C

| | | | | | | |
|---------|-------|-------|-----|------|----------------|---|
| 1890.52 | 194.4 | 12.35 | ... | 13.3 | 3 ⁿ | β |
| 1898.31 | 195.9 | 12.46 | ... | 13.5 | 2 ⁿ | β |

The nearest companion was detected with the 18½-inch; the other with the 36-inch. The variability of this star was discovered by SCHMIDT; period supposed to be about one year, 5½ to 6 m. The Harvard photometric magnitude is 5.2. BALL measured a distant star in his examination for parallax (*Dunsk Obsns.* III).

[β (1)...β ()...β (3048)...β (*Pub. L. O. 11*)...Hough (2378)...HΣ ()...]

β 66. D.M. (66°) 3995R.A. 20^h 42^m 53^s *l*
Decl. + 27° 1' *λ*

| | | | | | | |
|---------|-------|------|--------|-----|----------------|-----|
| 1876.00 | 158.9 | 1.23 | 8.6... | 9.1 | 5 ⁿ | J |
| 1883.16 | 159.5 | 1.57 | 8.2... | 8.5 | 5 ⁿ | En |
| 1892.84 | 161.7 | 1.57 | ... | ... | 2 ⁿ | Maw |
| 1898.70 | 159.5 | 1.16 | 8.4... | 8.9 | 4 ⁿ | D |

Discovered with the 6-inch.

[β (1)...β (*Mon. Not.* XXXIII, 351)...J 66...Hough (2378)...Maw (*Mem. R. A. S. L.*...Doolittle (*Pub. Flower Obsy.* 1)...]

β 268. Radcliffe 4938R.A. 20^h 43^m 11^s *l*
Decl. + 41° 38' *λ*

| | | | | | | |
|---------|-------|------|--------|-----|----------------|----|
| 1875.88 | 221.4 | 0.42 | 7.4... | 8.3 | 2 ⁿ | J |
| 1884.31 | 216.2 | 0.53 | ... | ... | 3 ⁿ | HΣ |
| 1888.64 | 216.4 | 0.5± | ... | ... | 7 ⁿ | Sp |
| 1893.62 | 218.4 | 0.52 | 7.8... | 8.8 | 3 ⁿ | W |

Discovered with the 9.4-inch at the Dartmouth College Observatory. About 21' *n* is OΣ 414.

[β (v)...β (*Mon. Not.* XXXV, 311)...J 61)...J (2081)...HΣ ()...Sp (11)...Wilson ()...]

β 365. O. Arg. N. 21118R.A. 20^h 43^m 30^s *l*
Decl. + 51° 21' *λ*

| | | | | | | |
|---------|-------|-------|--------|------|----------------|---|
| 1892.77 | 285.2 | 14.80 | 8.5... | 11.8 | 2 ⁿ | W |
| 1898.69 | 286.1 | 14.53 | 8.5... | 10.8 | 1 ⁿ | β |

Discovered with 6-inch. Σ 2732 is 1' 29' *ρ* and 0.7 *z*.

[β (1)...β (2062)...Wilson ()...]

β 366. O. Arg. N. 21117R.A. 20^h 43^m 47^s *l*
Decl. + 50° 3' *λ*

A and B

| | | | | | | |
|---------|---------|------|--------|-----|----------------|--------|
| 1876.44 | 128.5 | 1.40 | 8.2... | 8.5 | 2 ⁿ | J |
| 1893.55 | 127.5 | 1.24 | 8.2... | 8.5 | 2 ⁿ | J v |
| 1893.72 | 129.0 | 1.47 | 8.0... | 8.5 | 2 ⁿ | W |
| 1896.88 | (152.3) | 1.80 | ... | ... | 1 ⁿ | Morgan |
| 1898.48 | 128.6 | 1.42 | 8.3... | 8.4 | 3 ⁿ | D |
| 1898.69 | 130.5 | 1.24 | 8.5... | 8.7 | 1 ⁿ | β |

AB and C

| | | | | | |
|---------|------|-------|----------|----------------|---|
| 1875.60 | 28.2 | 35.88 | ... 12.0 | 1 ^m | J |
| 1891.08 | 24.0 | 31.50 | ... 12.0 | 3 ^m | B |
| 1899.50 | 22.8 | 31.82 | ... 12.2 | 2 ^m | A |

AB and D

| | | | | | |
|---------|------|-------|----------|----------------|---|
| 1899.50 | 92.6 | 30.94 | ... 14.0 | 2 ^m | A |
|---------|------|-------|----------|----------------|---|

Discovered with the 6-inch. There seems to be some angular motion in the close pair. In the field with 32 *Vulpeculae*. The proper motion of this star from BOSSERT is $0''.160$ in the direction of $138^\circ 5'$. The two measures of C give $0''.147$ in $131^\circ 3'$. This star is fixed in space with reference to the binary AB.

[β (VI)... β (2062,3114)... β (*Pub. L. O. II*)...J (I)...Perry (*Eng. Mech.* XXXVI, 65)...Engelmann (2742)...Dobereck 3466)...Brown ()...Aitken ()...]

 β 1034. *7 Aquarii*

R.A. $20^h 50^m 28.9$
Dec. $-1^\circ 35' 3''$

| | | | | | |
|---------|-------|------|-------------|----------------|---|
| 1888.68 | 165.0 | 2.29 | 6.2... 11.7 | 5 ^m | B |
| 1897.72 | 163.7 | 2.05 | ... | 3 ^m | A |

Discovered with the 36-inch. It is not a difficult pair. The measures of 1888 were made with the 12-inch. The principal star has a proper motion of $0''.033$ in the direction of $257^\circ 8'$ (AUWERS). It is very probable that this is a physical system.

[β (XV)... β (2878)... β (*Pub. L. O. II*)...Aitken (14429)...]

 β 764. S.D. 1115031

R.A. $2^h 52^m 22.9$
Dec. $+8^\circ 50' 0''$

A and B

| | | | | | |
|---------|-------|------|------------|----------------|-----|
| 1880.55 | 354.4 | 0.60 | 9.0... 9.2 | 1 ^m | B |
| 1886.75 | 173.2 | 0.64 | 9.2... 9.3 | 2 ^m | I M |
| 1893.75 | 353.8 | 0.79 | 9.3... 9.3 | 3 ^m | W |
| 1898.75 | 359.0 | 0.86 | 8.7... 8.7 | 3 ^m | Bd |

AB and C

| | | | | | | |
|---------|-------|--------|-----|-----|----------------|----|
| 1880.55 | 112.0 | 99.62 | ... | 9.0 | 1 ^m | B |
| 1893.71 | 112.3 | 99.64 | ... | 9.1 | 3 ^m | W |
| 1898.75 | 112.0 | 100.34 | ... | 8.4 | 3 ^m | Bd |

AB and D

| | | | | | | |
|---------|------|--------|-----|-----|----------------|----|
| 1880.55 | 21.6 | 137.45 | ... | 9.2 | 1 ^m | B |
| 1893.71 | 21.5 | 137.17 | ... | 9.1 | 3 ^m | W |
| 1898.75 | 21.6 | 137.80 | ... | 8.2 | 3 ^m | Bd |

Discovered with the 6-inch. The close pair is the ρ star of a small triangle. The other stars of the triangle, C and D, are S.D. (9^h) 5632 and 5635. WILSON measures 11.5 m star from AB, $90^\circ 55' 58''.20$ (189) 3.71 3.91. BOOTHROYD, $54^\circ 7' 50''.58$ (189) 7.50 3.91.

[β (XI)... β^2 ... β^3 ...I.M...Wilson ()...Boothroyd ()...]

 β 1137. *16 Aurigae*

R.A. $2^h 52^m 37.9$
Dec. $+5^\circ 16' 3''$

| | | | | | |
|---------|-------|------|-------------|----------------|---|
| 1889.44 | 344.3 | 6.88 | 6.0... 13.7 | 3 ^m | B |
| 1898.31 | 346.1 | 6.94 | 7.2... 13.2 | 2 ^m | B |
| 1898.72 | 343.9 | 7.20 | 6.0... 14.3 | 3 ^m | A |

Discovered with the 36-inch. This is a naked-eye star in *Cygnus*; Harvard photometric magnitude 5.9.

[β (XVI)... β (2346)... β (*Pub. L. O. II*)...Aitken (14885)...]

 β 765. *16 Aurigae*

R.A. $2^h 52^m 37.9$
Dec. $+5^\circ 16' 3''$

| | | | | | |
|---------|-------|------|-------------|----------------|-----|
| 1879.74 | 149.1 | 2.21 | 7.0... 31.0 | 3 ^m | B |
| 1891.25 | 139.3 | 2.00 | 6.9... 32.3 | 3 ^m | B |
| 1891.76 | 126.4 | 2.21 | 7... 32.1 | 1 ^m | Sei |
| 1898.68 | 130.3 | 1.86 | 7.0... 10.8 | 3 ^m | A |
| 1898.73 | 140.7 | 2.32 | 7... 12.3 | 3 ^m | Bd |

Discovered with the 6-inch at Mt. Hamilton in 1879. In *Cord. G.C.* 7.1 m.

[β (XV)... β (3114)... β (*Pub. L. O. II*)...SIMPSON (3133)...Aitken (3585)...Boothroyd ()...]

 β 678. *16 Aurigae*

R.A. $2^h 52^m 37.9$
Dec. $+5^\circ 16' 3''$

| | | | | | |
|---------|-------|------|-------------|----------------|-----|
| 1878.78 | 185.7 | 2.45 | 8.0... 31.3 | 3 ^m | B |
| 1879.64 | 189.7 | 2.37 | 8.0... 11.0 | 2 ^m | Cin |
| 1880.80 | 192.6 | ... | 8.3... 12.3 | 3 ^m | I M |

| | | | | | |
|---------|-------|------|--------------|----|---|
| 1801.12 | 144.8 | 2.42 | S.O. | 30 | W |
| 1801.32 | 144.8 | 2.40 | | 30 | W |
| 1801.38 | 144.8 | 2.50 | S.4. | 25 | D |
| 1802.38 | 144.8 | 2.55 | S.O. | 25 | A |

Discovered with the 18 $\frac{1}{2}$ -inch.

{ β (X), β (Y), Cinf., LM, Wilson (), Brown (),
Atiken (1885), . . . Doolittle (*Pub. Flower Obs.*, 1) . . .}

β 68. D.M. (61) 279

R.A. 20^h 57^m 5.7
Decl. $-34^{\circ} 13' 5''$

| | | | | | | |
|---------|-------|------|-----|------|----|---|
| 1851.27 | 151.0 | 2.20 | S.3 | 16.2 | 30 | J |
| 1882.68 | 151.0 | 2.52 | S.3 | 16.0 | 30 | W |
| 1892.67 | 151.0 | 2.67 | S.3 | 8.9 | 30 | W |

Discovered with the 6-inch. Unchanged. Σ 2741
is 56' β and 15' 4 μ .

{ β (X), β (Y), β (Z), β (W), β (V), β (U), β (T), β (S),
Meeh. XXXVI, 65), . . . Wilson (), . . .}

β 1210. D.M. (61) 111

R.A. 20^h 57^m 5.7
Decl. $-34^{\circ} 13' 5''$

A and B

| | | | | | |
|---------|-------|------|------|----|---------|
| 1808.42 | 117.2 | 2.35 | 12.2 | 30 | β |
| 1808.42 | 117.2 | 2.34 | 12.2 | 25 | A |

(C and D) (12.1 and 1)

| | | | | | |
|---------|-------|------|------|----|------------|
| 1851.70 | 135.0 | 2.00 | 3.0 | 20 | O Σ |
| 1890.63 | 134.2 | 4.28 | 11.2 | 30 | β |
| 1898.46 | 133.0 | 4.31 | | 20 | β |
| 1898.60 | 133.4 | 4.32 | 11.2 | 20 | A |

(C and D) (12.1 and 1)

| | | | | | |
|---------|------|-------|------|----|------------|
| 1847.49 | 27.6 | 12.1 | 7.0 | 30 | O Σ |
| 1868.43 | 29.7 | 12.81 | 7.2 | 30 | J |
| 1890.63 | 28.6 | 13.80 | | 30 | β |
| 1898.43 | 28.0 | 14.00 | | 20 | β |
| 1898.43 | 14.0 | 13.99 | 11.0 | 30 | A |

(C and D)

1898.43 (14.0) 13.99 11.0 30 A

triple, O Σ 425, was discovered with the 36-inch.
All the measures of the other stars are given above,

except a measure of the angle of AD on one night,
40 = O Σ 570, and from this and the angle of CD
he gives 4' 11 for the distance of CD.

{ β (X), β (Y), β (Z), β (W), β (V), β (U), β (T), β (S),
Wilson (1885), . . . Doolittle (*Pub. Flower Obs.*, 1) . . .}

β 1290. D.M. (61) 3142

R.A. 20^h 56^m 50.7
Decl. $-34^{\circ} 47' 13''$

A and B

| | | | | | | |
|---------|------|------|-----|-----|----|---------|
| 1898.44 | 16.3 | 3.90 | 9.2 | 9.4 | 30 | β |
|---------|------|------|-----|-----|----|---------|

A and C

| | | | | | |
|---------|------|-----|------|----|---------|
| 1898.44 | 27.3 | 3.5 | 13.3 | 30 | β |
|---------|------|-----|------|----|---------|

B and C

| | | | | | |
|---------|------|------|------|----|---------|
| 1898.44 | 28.1 | 2.12 | 13.8 | 30 | β |
|---------|------|------|------|----|---------|

Discovered with the 40-inch. A pair of small
stars, each with a faint companion. It is 64' f and
2' s of 59 Cygni (Σ 2743).

β 472. D.M. (61) 2078

R.A. 20^h 57^m 5.7
Decl. $-34^{\circ} 13' 5''$

| | | | | | | |
|---------|-----|------|-----|-----|----|---|
| 1877.69 | 5.8 | 0.66 | 8.2 | 8.5 | 30 | J |
| 1893.67 | 6.0 | 0.77 | 8.3 | 8.7 | 30 | W |
| 1898.67 | 4.4 | 0.87 | 8.3 | 8.7 | 30 | D |

Discovered with the 6-inch.

{ β (X), β (Y), β (Z), β (W), β (V), β (U), β (T), β (S),
Wilson (), . . . Doolittle (*Pub. Flower Obs.*, 1) . . .}

β 69. W.XX 1743

R.A. 20^h 57^m 11.7
Decl. $-34^{\circ} 24' 13''$

A and B

| | | | | | | |
|---------|-------|------|--------|--------|----|---------|
| 1875.42 | 314.6 | 0.97 | 8.2 | 9.6 | 30 | J |
| 1881.62 | 313.9 | 0.85 | 8.0 | 8.5 | 20 | Ho |
| 1882.68 | 313.5 | 1.22 | 8. . . | 9. . . | 10 | bow |
| 1884.22 | 313.7 | 1.14 | 8.0 | 9.0 | 60 | En |
| 1891.61 | 316.5 | 0.95 | 8.3 | 9.3 | 30 | β |
| 1896.72 | 311.7 | 0.72 | | | 10 | Lew |
| 1897.62 | 315.2 | 1.02 | | | 20 | Bow |
| 1898.72 | 311.1 | 0.97 | | | 10 | Bow |
| 1898.73 | 313.9 | 0.85 | | | 10 | Lew |

AB and C

| | | | | | |
|---------|-------|-------|-----|----------------|---------|
| 1875.81 | 238.4 | 78.44 | 7.6 | 1 ^m | J |
| 1884.78 | 238.9 | 78.47 | 8.1 | 3 ^m | En |
| 1891.34 | 239.0 | 77.88 | 8.1 | 3 ^m | β |
| 1899.42 | 239.5 | 77.80 | | 1 ^m | β |

C and D (+ Ho 599)

| | | | | | |
|---------|-------|-------|-----|----------------|---------|
| 1891.84 | 154.6 | 19.47 | 1.3 | 1 ^m | β |
| 1895.65 | 155.0 | 18.40 | 1.2 | 2 ^m | Ho |
| 1899.42 | 153.0 | 18.91 | | 2 ^m | β |

Discovered with the 6-inch. The measures show no change in the close pair. C and D make Ho 599.

[β (I)... β (*Mon. Not. XXXIII*, 351...), β (1314)... β (*Pub. L. O.* II)... β (I)...Perry (*Eng. Mech.* XXXVI, 65)...Engelmann (2678)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Hough (3558)...]

 β 1211. Lalande 40714

R.A. 20^h 57^m 15^s V
Decl. -18° 35' V

| | | | | | | |
|---------|-------|------|-----|-----|----------------|---------|
| 1890.65 | 344.7 | 0.58 | 7.5 | 8.1 | 3 ^m | β |
| 1897.72 | 347.6 | 0.67 | | | 3 ^m | A |
| 1897.75 | 349.0 | 0.52 | 7.8 | 9.0 | 1 ^m | See |

Discovered with the 12-inch; the f star of a small triangle.

[β (xvii)... β (3047)... β (*Pub. L. O.* II)...Aitken (*A. J.* 429)...See (3496)...]

 β 156. Groombridge 3369

R.A. 20^h 57^m 30^s V
Decl. +40° 6' V

| | | | | | | |
|---------|-------|------|-----|-----|----------------|---------|
| 1873.41 | 241.6 | 1.05 | 7.1 | 9.4 | 4 ^m | J |
| 1891.62 | 245.9 | 0.99 | 7.5 | 9.9 | 3 ^m | β |
| 1896.64 | 247.6 | 1.11 | | | 2 ^m | Lew |
| 1898.57 | 242.1 | 1.14 | 7.8 | 9.5 | 4 ^m | D |

Discovered with the 6 inch. It is 29' n. of α Cynos (O Σ 426).

[β (III)... β (*Mon. Not.* XXXIV, 5)... β (1314)... β (*Pub. L. O.* II)... β (I)...Lewis (*Mon. Not.* LIX, 400)...Doollittle (*Pub. Flower Obs.* I)...]

 β 445. C α 287

R.A. 20^h 58^m 25^s V
Decl. +23° 37' V

| | | | | | | |
|---------|-------|------|-----|------|----------------|------------|
| 1877.58 | 106.6 | 4.60 | 7.5 | 12.6 | 1 ^m | J |
| 1878.58 | 114.4 | 4.96 | 7.0 | 12.5 | 1 ^m | O Σ |
| 1881.89 | 108.9 | 4.73 | 7.0 | 11.4 | 3 ^m | Ho |
| 1884.66 | 111.1 | 4.99 | | | 2 ^m | H Σ |
| 1892.68 | 119.2 | 4.77 | 7.5 | 11.8 | 2 ^m | W |

Discovered with the 18 $\frac{1}{2}$ -inch. Lalande 40821.

[β (viii)... β (*Am. Jour. Sci.* July 1877)... β (I)...H Σ ()...O Σ (*Poulkova Obs.* X)...Hough (2978)...Wilson ()...]

 β 1138. Lalande 40870

R.A. 20^h 58^m 31^s V
Decl. +45° 22' V

| | | | | | | |
|---------|-------|-----------|-----|-----|----------------|------------|
| 1888.82 | 185.8 | 0.3 \pm | 7 | 7 | 2 ^m | H α |
| 1889.44 | 188.7 | 0.29 | 7.2 | 8.5 | 3 ^m | β |
| 1894.75 | 187.4 | 0.25 | 7 | 7 | 1 ^m | Ho |
| 1897.92 | 189.2 | 0.36 | | | 1 ^m | Lew |
| 1898.72 | 185.7 | 0.32 | 7.1 | 8.6 | 2 ^m | A |

Discovered with the 36-inch, but it is given in a list of new pairs subsequently published by Hough, by whom it was observed in 1888 (= Ho 282). In D.M. 6.7 m; *A. G. C.* 7.2 m.

[β (xvi)... β (29850)... β (*Trans. L. O.* II)...H α (2975, 3588)...Lewis (*Mon. Not.* LIX, 400)...Aitken (3585)...]

 β 269 = β 835. Lalande 40815

R.A. 20^h 58^m 40^s V
Decl. +7° 17' V

| | | | | | | |
|---------|-------|------|-----|------|----------------|------------|
| 1876.18 | 252.6 | 1.58 | 8.1 | 12.1 | 5 ^m | J |
| 1879.64 | 247.3 | | 8.5 | 11.2 | 1 ^m | C B |
| 1881.66 | 253.7 | 0.84 | 8.0 | 11.0 | 3 ^m | β |
| 1885.58 | 253.1 | 1.15 | | | 3 ^m | H Σ |
| 1887.74 | 253.2 | 1.02 | 8.2 | 11.2 | 3 ^m | Com. |
| 1891.38 | 253.3 | 1.00 | | | 3 ^m | Sp |
| 1898.48 | 249.9 | 1.11 | 9.1 | 9.9 | 4 ^m | D |

Discovered with the 9.4-inch at the Dartmouth College Observatory. It was again found with the 13 $\frac{1}{2}$ -inch of the Washington Observatory, and inadvertently included as new in β (xii). It is possible

C and D

| | | | | | | |
|---------|-------|------|------|------|----|---------|
| 1890.65 | 317.9 | 6.15 | 14.0 | 14.7 | 2H | β |
| 1898.58 | 316.1 | 5.14 | 14.2 | 14.5 | 1H | A |

AB and C

| | | | | | | |
|---------|------|-------|--|--|----|---------|
| 1890.65 | 27.2 | 12.02 | | | 2H | β |
| 1898.58 | 30.9 | 12.20 | | | 1H | A |

The bright star was suspected to be a close pair with the 6-inch in 1873, and verified with the same instrument in 1875. In measuring this with the 36-inch, the double companion, CD, was detected. These are very faint stars, and require a large aperture. There seems to be no sensible change thus far in the close pair. Lalande 40892.

[β (vi)... β (2062,3048)... β ... β (Pub. L. O. II)... β (i)...
Cin⁴...Cin⁵...Pritchett (Pub. Morrison Obsv. I)...Wilson
(Cin²⁰)...LM...Lv⁴...Sp (III)...Tarrant (3186)...
Arken (3585)...

 β 679.

R.A. 21^h 1^m 24^s 0
Decl. - 43° 12' 0

| | | | | | | |
|---------|------|------|----|------|----|---------|
| 1878.10 | 68.1 | 0.38 | 10 | 11.0 | 2H | β |
| 1889.45 | 65.0 | 0.52 | 10 | 11.0 | 3H | β |
| 1896.56 | 54.0 | 0.42 | | | 1H | L |

This close and exceedingly minute pair was discovered with the 18½-inch. It is too faint for the D.M. It is in a low-power field *sp* D.M. (43°) 3802, 8.8 m.

[β (X)... β ... β (2957)... β (Pub. L. O. II)...Lewis (Mon. LIX, 400)...

 β 473. S.D. 11 15800

R.A. 21^h 1^m 24^s 0
Decl. - 43° 12' 0

| | | | | | | |
|---------|-------|------|-----|------|----|----|
| 1877.08 | 115.5 | 4.71 | 0.0 | 10.2 | 3H | J |
| 1893.53 | 114.0 | 1.88 | 8.5 | 14 | 2H | Lv |
| 1893.81 | 118.5 | 1.79 | 8.5 | | 1H | W |
| 1898.65 | 118.0 | 1.82 | 8.2 | | 3H | C |

Discovered with the 6-inch. In S.D. 8.0 m. A 12.7 m star, COGSHALL 35722: 25°37' (1898.67) 2H.

[β (ix)... β (Mon. Not. xxxviii, 78)... β (i)...Lv (A. J. 382)
...Wilson ()...Cogshall ()...

 β 158. Lalande 15871

R.A. 21^h 1^m 24^s 0
Decl. - 47° 19' 0

| | | | | | | |
|---------|-------|-------|-----|------|----|---------|
| 1875.72 | 314.9 | 10.44 | 7.3 | 11.5 | 2H | J |
| 1876.57 | 314.6 | 10.72 | 8.5 | 12.5 | 1H | β |
| 1891.57 | 314.1 | 10.84 | 8.0 | 11.2 | 2H | β |
| 1898.86 | 313.9 | 10.89 | 7.9 | 11.1 | 4H | D |

Discovered with the 6-inch. In the field *f* a new double nebula was found at the same time (DREYER 7026).

[β (i)... β (2062,3048)... β ... β (Pub. L. O. II)... β (i)...
L. O. II)... β (i)...Doolittle (Pub. Flower Obsv. I)...

 β 680. D.M. 453 2546

R.A. 21^h 1^m 24^s 0
Decl. - 43° 12' 0

A and B

| | | | | | | |
|---------|-------|------|-----|------|----|------------|
| 1877.57 | 134.4 | 0.5± | 8 | 8 | 1H | β |
| 1877.70 | 128.3 | 0.63 | 8.1 | 8.6 | 2H | J |
| 1885.53 | 309.0 | 0.70 | | | 2H | H Σ |
| 1890.74 | 306.7 | 0.58 | | | 0H | Sp |
| 1891.65 | 310.1 | 0.64 | 8.4 | 10.2 | 3H | β |

AB and C

| | | | | | | |
|---------|------|-------|--|-------|----|------------|
| 1890.58 | 34.2 | 23.95 | | | 1H | Sp |
| 1885.52 | 33.6 | 23.41 | | | 1H | H Σ |
| 1891.00 | 32.8 | 23.31 | | 110.7 | 2H | β |

Discovered with the 18½-inch. Further measures of the close pair are needed.

[β (X)... β (2957)... β (Pub. L. O. II)...Lewis (Mon. LIX, 400)...

 β 836. W & N 1885

R.A. 21^h 1^m 24^s 0
Decl. - 47° 54' 0

A and B

| | | | | | | |
|---------|-------|------|-----|----|----|---------|
| 1881.63 | 191.4 | 0.62 | 9.0 | 11 | 3H | β |
| 1888.08 | 189.6 | 0.65 | 9.2 | 11 | 3H | Com |
| 1880.29 | 191.4 | 0.63 | 9.1 | 11 | 3H | β |
| 1898.69 | 183.4 | 0.78 | 8.5 | 11 | 3H | A |

β 681. γ Equulei

| | | | | | | |
|---------|------|------|------|------|----|---------|
| 1880.20 | 65.0 | 1.07 | 12.2 | 11.2 | 39 | β |
| 1898.60 | 67.0 | 1.22 | 12.8 | 12.2 | 26 | A |

All stars β 2

| | | | | | | |
|---------|-------|------|------|------|----|---------|
| 1877.60 | 140.0 | 1.25 | 12.2 | 12.2 | 36 | β |
| 1881.15 | 140.0 | 1.25 | 12.2 | 12.2 | 36 | Com |
| 1888.82 | 140.0 | 1.25 | 12.2 | 12.2 | 36 | β |
| 1898.55 | 140.0 | 1.25 | 12.2 | 12.2 | 36 | A |

The principal pair was discovered with the 15 $\frac{1}{2}$ -inch of the Washburn Observatory, and it was then stated that C might also be double. This was verified with the 36-inch in 1888, thus making a pretty but difficult quadruple group.

[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]
[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]

 β 688. D.M. 71 14433

| |
|----------------|
| R.A. 21 28 1 |
| Decl. - 3 30 5 |

A and B

| | | | | | | |
|---------|-------|------|-----|------|----|---------|
| 1880.58 | 222.3 | 1.20 | 8.9 | 11.7 | 39 | β |
| 1891.00 | 226.2 | 1.23 | 9.6 | 12.2 | 29 | W |
| 1898.48 | 223.9 | 1.19 | 9.0 | 10.0 | 19 | D |

A and C

| | | | | | |
|---------|------|------|-----|----|---------|
| 1880.58 | 55.4 | 1.66 | 8.9 | 39 | β |
| 1891.00 | 51.1 | 1.54 | 9.2 | 29 | W |
| 1898.45 | 51.2 | 1.54 | 8.8 | 19 | D |

Discovered with the 18 $\frac{1}{2}$ -inch. Change in AB is probable.

[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]
[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]

 β 837. D.M. 71 14433

| |
|----------------|
| R.A. 21 28 1 |
| Decl. - 3 30 5 |

| | | | | | | |
|---------|-------|------|-----|------|----|---------|
| 1881.73 | 189.7 | 1.18 | 8.4 | 10.4 | 39 | β |
| 1886.84 | 186.1 | 1.11 | 8.4 | 10.4 | 39 | UL |
| 1887.77 | 189.3 | 3.53 | 8.0 | 10.4 | 39 | Com |
| 1898.54 | 189.3 | 3.44 | 8.5 | 10.4 | 39 | D |
| 1898.54 | 189.3 | 3.47 | 8.3 | 9.5 | 19 | β |

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory. Without change.

[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]
[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]

 β 71. γ Equulei

| |
|----------------|
| R.A. 21 41 30 |
| Decl. - 3 30 5 |

A and C

| | | | | | | |
|---------|------|-------|-----|------|----|---------|
| 1877.73 | 10.0 | 41.34 | 4.8 | 1.2 | 19 | β |
| 1888.82 | 9.2 | 43.33 | ... | ... | 39 | β |
| 1898.57 | 7.9 | 44.33 | ... | 10.5 | 39 | β |

A and B. Knott

| | | | | | | |
|---------|-------|------|-----|------|----|---------|
| 1807.5 | 276.8 | 2.13 | ... | 11.0 | 29 | Kn |
| 1877.73 | 274.5 | 2.16 | ... | ... | 19 | β |
| 1883.77 | 274.6 | 2.17 | ... | ... | 39 | III |
| 1888.82 | 275.4 | 2.14 | ... | ... | 39 | β |
| 1897.82 | 273.2 | 2.40 | ... | ... | 49 | A |
| 1898.55 | 275.0 | 2.30 | ... | ... | 19 | β |

The distant star was noted with the 6-inch. The bright star has a proper motion of 0.165 in the direction of 165 $^{\circ}$ 5. This corresponds to the change in C shown by the measures. Knott's companion has the same proper motion as the principal star, and hence this is probably a physical pair. The measures show no relative motion.

γ Equulei and 6 Equulei, about 5' distant, make Σ 54, App. I.

[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]
[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]

The following relate principally to B and D:

[Knott *Mem. R. A. S. New Obs. New. XXXII*, 47; XLVII, 11)... d (11)... d (1574)... Engelmann (*Mess. Neunzig Doppelsterne*, 1865)... Radcliffe (*Obs.*, XXV... Hall (11)... Pritchett (*Pub. Morrison Obs.*, 1)... Tarrant (2899)... Jedrzejewicz (2343)... Maiebekato (*Obs.*, 1892)... Aitken (*A. J.*, 429)...]

 β 251. O. Arg. S. 21193

| |
|----------------|
| R.A. 21 41 30 |
| Decl. - 3 30 5 |

| | | | | | | |
|---------|-------|------|-----|-----|----|---------|
| 1877.70 | 233.6 | 2.71 | 7.0 | 9.5 | 19 | Cin |
| 1879.69 | 234.4 | ... | 8.0 | 9.5 | 19 | β |
| 1896.74 | 234.3 | 3.58 | 7.8 | 9.6 | 39 | See |

Discovered with the 6-inch.

[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]
[*Pub. Washburn Obs.*, VII, ... Aitken (1888)...]

β 159. Lalande 41178R.A. 21^h 09^m 21^s $\frac{1}{2}$
Decl. + 17° 12' $\frac{1}{2}$

A and B

| | | | | | | |
|---------|-------|------|-------|-----|----------------|-------|
| 1876.69 | 318.4 | 1.33 | 6.1.. | 0.2 | 6 ^u | J |
| 1882.68 | 300.0 | 1.34 | ... | ... | 1 ^u | Perry |
| 1889.53 | 316.7 | 1.28 | 7.1.. | 0.7 | 3 ^u | β |
| 1898.56 | 316.6 | 1.22 | 6.7.. | 0.8 | 4 ^u | D |

A and C (= OΣ (App.) 215)

| | | | | | | |
|---------|-------|---------|-----|-----|----------------|----|
| 1875.72 | 189.6 | 1.34.14 | ... | 6.9 | 4 ^u | J |
| 1886.48 | 189.5 | 1.34.21 | ... | 7.4 | 4 ^u | Fr |
| 1889.53 | 189.4 | 1.34.16 | ... | 7.3 | 2 ^u | β |
| 1898.56 | 189.5 | 1.33.04 | ... | 7.0 | 4 ^u | D |

The close pair was discovered with the 6-inch. There is a faint star about 14" from AB in the direction of 147°. All the measures of OΣ (App.) 215 are given above. If there is any proper motion, it is evidently common to all the components.

β (IV)...β (Mon. Not. XXXIV, 382)...β (2075)...β (Pub. L. O. 11)...Δ (1)...Perry (Eng. Mech. XXXVI, 65)...Franz (3080)...Doolittle (Pub. Flower Obs. 1)...]

β 270. Equule 19R.A. 21^h 57^m 31^s $\frac{1}{2}$
Decl. + 6° 43' $\frac{1}{2}$

A and B

| | | | | | | |
|---------|-------|------|-------|-----|----------------|----|
| 1875.82 | 354.6 | 0.62 | 7.4.. | 0.7 | 2 ^u | J |
| 1877.72 | 347.4 | 1.26 | 7.0.. | 0.9 | 1 ^u | β |
| 1885.61 | 353.2 | 0.67 | ... | ... | 2 ^u | HΣ |
| 1889.44 | 350.0 | 0.5± | ... | ... | 7 ^u | Sp |
| 1891.60 | 347.5 | 0.70 | 7.0.. | 0.8 | 2 ^u | β |
| 1898.71 | 344.9 | 0.61 | 7.2.. | 0.8 | 3 ^u | A |
| 1898.73 | 347.7 | 0.56 | 7.0.. | 0.8 | 1 ^u | β |

A and C

| | | | | | | |
|---------|------|-------|-----|------|----------------|---|
| 1877.72 | 32.4 | 2.0 | ... | 13 | 1 ^u | β |
| 1898.70 | 32.7 | 32.55 | ... | 12.7 | 2 ^u | β |
| 1898.71 | 32.1 | 32.80 | ... | 12.8 | 2 ^u | A |

A and D (= S 781)

| | | | | | | |
|---------|-------|--------|-------|-----|----------------|---|
| 1821.00 | 173.0 | 183.21 | 6.1.. | 7 | 2 ^u | S |
| 1877.72 | 172.6 | 183.40 | 7.0.. | 7.0 | 1 ^u | β |
| 1891.00 | 172.0 | 181.52 | ... | 7.5 | 2 ^u | β |
| 1898.66 | 172.8 | 184.44 | ... | ... | 3 ^u | β |
| 1898.66 | 172.3 | 184.40 | ... | 7.5 | 1 ^u | A |

The close pair was discovered with the 9.4-inch of the Dartmouth College Observatory. So far there is no material change. All the measures of South's pair are given. A and D are respectively Lalande 41173 and 41179. Each star was observed twice by LALANDE. The mean differences of R.A. and Decl. give for the position-angle and distance at that time 172° 9' : 184' 86.

β (VI)...β (Mon. Not. XXXV, 31)...β (31141)...β (W. L. O. 11)...Sp (III)...HΣ (1)...A (Kron. 3885)...]

β 681. Runkler 1004R.A. 21^h 57^m 48^s $\frac{1}{2}$
Decl. + 19° 26' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|------|----------------|----|
| 1878.64 | 239.7 | 2.51 | 7.0... | 11.3 | 3 ^u | β |
| 1884.61 | 232.0 | 2.86 | ... | ... | 2 ^u | HΣ |
| 1892.79 | 234.3 | 2.33 | 7.0... | 11.0 | 1 ^u | Ho |
| 1897.84 | 240.6 | 3.10 | ... | ... | 1 ^u | Br |
| 1898.57 | 235.0 | 2.89 | 7.2... | 11.2 | 4 ^u | D |
| 1899.50 | 238.2 | 2.94 | 7.1... | 11.0 | 2 ^u | β |

Discovered with the 18½-inch. Without change.

β (X)...β'...Hough (3134)...HΣ (1)...Brown (1)...Doolittle (Pub. Flower Obs. 1)...]

β 160. Lalande 14242R.A. 21^h 57^m 48^s $\frac{1}{2}$
Decl. + 45° 13' $\frac{1}{2}$

B and C

| | | | | | | |
|---------|-------|------|--------|------|----------------|---|
| 1892.67 | 119.7 | 0.11 | 11.8.. | 11.2 | 1 ^u | W |
| 1898.86 | 115.2 | 0.41 | 12.2.. | 12.7 | 4 ^u | D |

A and B

| | | | | | | |
|---------|-------|-------|-------|-----|----------------|---|
| 1892.67 | 154.3 | 56.96 | 7.5.. | ... | 1 ^u | W |
| 1898.86 | 154.2 | 57.47 | 7.3.. | ... | 4 ^u | D |

Distant double companion noted with the 6-inch. Not likely to be of any special interest.

β (III)...β (Mon. Not. XXXV, 311)...Woolf (1)...1816 (W. L. O. 11)...]

β 682. Lalande 41227R.A. 21^h 58^m 30^s $\frac{1}{2}$
Decl. + 4° 32' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|-------|------|----------------|----|
| 1877.77 | 105.6 | 5.94 | 7.5.. | 12.0 | 1 ^u | β |
| 1885.66 | 103.5 | 5.74 | ... | ... | 2 ^u | HΣ |

General Catalogue of Double Stars

| | | | | | | |
|---------|-------|------|-----|------|----|---------|
| 1881.88 | 100.5 | 8.07 | 7.1 | 12.5 | 26 | β |
| 1882.43 | 100.5 | 8.07 | 7.1 | 12.5 | 66 | D |
| 1883.44 | 100.2 | 8.28 | 7.0 | 13.3 | 69 | β |

Discovered with the 18½-inch.

| | | | | | | |
|---------|-------|--------|--------|-----|-----|-----|
| 1883.10 | 100.4 | 8.0000 | 4.4186 | 1.0 | 112 | () |
|---------|-------|--------|--------|-----|-----|-----|

[Dawson (*Pub. Flower Obs.* 1)...]

β 1201. D.M. (35) 1381

R.A. 21^h 00^m 27^s 7
Decl. δ 35° 13' 3"

| | | | | | |
|---------|-------|------|------------|----|---------|
| 1886.76 | 151.5 | 1.39 | 8.5...11.0 | 2n | Ho |
| 1891.85 | 152.4 | 1.72 | 8.5...10.7 | 3n | β |
| 1895.88 | 150.6 | ... | ... | 1n | Sp |
| 1898.90 | 151.2 | 1.57 | ... | 3n | A |

This pair was discovered with the 18½-inch in September 1884, but was not included in the lists of new pairs of that time.

| | | | | | |
|---------|-------|------|------------|----|----|
| 1891.85 | 152.4 | 1.72 | 8.5...10.7 | 3n | Ho |
|---------|-------|------|------------|----|----|

...Sp (III)...Aitken (*A. J.* 429)...]

β 161. W. N.N. 107

R.A. 21^h 16^m 53^s 7
Decl. δ 35° 35' 3"

Band 1

| | | | | | | |
|---------|-------|------|------|------|----|---------|
| 1891.84 | 100.8 | 7.40 | 10.2 | 11.5 | 26 | β |
| 1898.71 | 318.5 | 7.40 | ... | 11.0 | 1n | β |

Band 2

| | | | | | | |
|---------|-------|--------|-----|------|----|---------|
| 1891.84 | 100.8 | 10.00 | 5.1 | 10.0 | 2n | β |
| 1898.71 | 319.0 | 100.03 | 7.2 | 9.0 | 1n | β |

Band 3

| | | | | | | |
|---------|-------|-------|-----|-----|----|---------|
| 1891.84 | 100.8 | 10.00 | ... | ... | 1n | β |
| 1898.71 | 318.0 | 33.00 | ... | ... | 1n | β |

Band 4

| | | | | | |
|---------|------|-------|-------------|----|---------|
| 1898.71 | 19.2 | 10.86 | 13.5...12.0 | 1n | β |
|---------|------|-------|-------------|----|---------|

The distant double companion was found with the 6-inch. The declination was erroneously given 5° 45' in β (III). A and B are respectively S.D. (4') 54.4 and 54.3, 8.3 and 9.3 m.

| | | | | | | |
|---------|-------|-------|------|------|----|-----|
| 1891.84 | 100.8 | 10.00 | 11.5 | 11.5 | 1n | () |
|---------|-------|-------|------|------|----|-----|

β 162. D.M. (35) 1419

R.A. 21^h 12^m 17^s 9
Decl. δ 35° 10' 3"

| | | | | | | |
|---------|-------|------|--------|-----|----|---------|
| 1875.11 | 242.5 | 1.08 | 8.1... | 8.5 | 4n | J |
| 1880.77 | 241.5 | 0.68 | 8.0... | 8.0 | 1n | β |
| 1883.71 | 67.8 | 1.28 | 8.1 | 8.3 | 3n | En |
| 1891.63 | 243.5 | 1.09 | 8.5... | 8.6 | 3n | β |

Discovered with the 6-inch. Probably fixed. A 13m star in the direction of 138° 5.

| | | | | | |
|---------|-------|------|------------|----|---|
| 1875.11 | 242.5 | 1.88 | 8.1... 8.8 | 4n | J |
|---------|-------|------|------------|----|---|

[*Mon. Not. XXXIV*, 549. *B. J.* 3444. *B. J.* 3465. *J. O. U.* 3441. *J.* 120861. *Engelmann* 120781.]

β 163. Lalande 11386

R.A. 21^h 12^m 17^s 9
Decl. δ 35° 10' 3"

| | | | | | |
|---------|-------|------|------------|----|---------|
| 1876.09 | 252.3 | 1.15 | 7.1... 9.0 | 4n | d |
| 1878.60 | 256.9 | 0.87 | 7.0... 9.0 | 1n | OΣ |
| 1884.31 | 254.3 | 1.10 | ... | 3n | HΣ |
| 1887.79 | 251.3 | 0.68 | 7...10 | 3n | HI |
| 1891.52 | 254.6 | 0.75 | 7.2... 9.8 | 3n | β |
| 1892.91 | 248.1 | 0.57 | ... | 2n | Sp |
| 1895.46 | 251.9 | 0.56 | ... | 5n | Sp |
| 1898.69 | 246.0 | 0.63 | 7.2... 9.8 | 2n | Lew |
| 1898.76 | 253.2 | 0.63 | 7.0... 9.6 | 3n | A |

Discovered with the 6-inch. This star has a proper motion of 0.081 in the direction of 180° 0 (KUSTNER). There is no relative change, but the components have the same proper motion.

| | | | | | |
|---------|-------|------|------------|----|---|
| 1876.09 | 252.3 | 1.15 | 7.1... 9.0 | 4n | d |
|---------|-------|------|------------|----|---|

[*Mon. Not. XXXIV*, 549. *B. J.* 3444. *B. J.* 3465. *J. O. U.* 3441. *J.* 120861. *Engelmann* 120781.]

β 271. Lalande 41393

R.A. 21^h 12^m 17^s 9
Decl. δ 35° 10' 3"

Band 1

| | | | | | |
|---------|-------|------|-------------|----|---------|
| 1876.09 | 256.0 | 2.21 | 7.2... 9.7 | 1n | Cin |
| 1877.60 | 233.3 | 2.14 | 7.5... 16.0 | 1n | Cin |
| 1879.68 | 225.3 | ... | 6.0...10.0 | 1n | Cin |
| 1879.69 | 231.8 | 2.30 | 6.5... 9.5 | 1n | Cin |
| 1886.78 | 237.5 | 2.77 | 6.0... 9.0 | 1n | LM |
| 1891.54 | 237.2 | 2.70 | 7.0...10.4 | 2n | β |
| 1897.24 | 241.4 | 3.19 | 7.7...10.7 | 5n | See |
| 1898.71 | 239.8 | 2.90 | 6.8... 9.1 | 4n | D |
| 1898.84 | 236.3 | 3.37 | ... | 1n | β |

A and β 1898.84 74.2 74.57 12.2 19 β

Discovered with the 9.4-inch at the Dartmouth College Observatory. It is a most interesting binary from the large common proper motion of the components. The annual movement is 0.693 in the direction of 245.3 (PORTER). The relative motion is slow, so that the period must be a long one. The magnitude in GOULD is 6.7.

[β (v)... β (*Mon. Not. XXXV*, 31)... β (3114)... β (*Pub. L. O. II*)... β (Cin³...Cin⁴...Cin⁵...Cin⁶...LM...See (3496)...Doolittle (*Pub. Flower Obs.*, 1)...]

 β 252. Lalande 41364

R. A. 21^h 42^m 58^s ϵ
Decl. — 27° 34' 3"

| | | | | | | | |
|---------|-------|------|-----|-----|-----|----|-----|
| 1877.54 | 275.4 | 2.53 | 8.2 | ... | 8.3 | 59 | Cin |
| 1885.67 | 296.3 | 2.44 | 8.0 | ... | 8.1 | 29 | W |
| 1888.65 | 277.7 | 2.65 | 8.2 | ... | 8.2 | 19 | Lv |
| 1891.73 | 279.2 | 2.67 | ... | ... | ... | 19 | Col |
| 1896.89 | 276.9 | 2.59 | 8.5 | ... | 8.5 | 29 | See |
| 1897.74 | 276.8 | 2.55 | 8.1 | ... | 8.1 | 29 | Sc |

Discovered with the 6-inch. Unchanged. The measures in Cin³ and Lv³ of this pair are erroneously credited to another double in the vicinity, 2nd 10' β and γ 47' η .

[β (v)... β (*Mon. Not. XXXV*, 31)...Cin³...Cin⁴...Cin⁵...Wilson (Cin³)...Lv³...Collins (*Proc. Haverford Coll. Obs.*, 1892)...See (3496)...Scott (*Mon. Not. LIX*, 427)...]

 β 280. W. XXI, 180

R. A. 21^h 41^m 22^s ϵ
Decl. — 27° 19' 24" ϵ

A and B

| | | | | | | | |
|---------|-------|------|-----|-----|------|----|---------|
| 1878.53 | 137.8 | 0.90 | 8.2 | ... | 10.0 | 15 | β |
| 1881.64 | 135.4 | 0.67 | ... | ... | ... | 10 | Ho |
| 1898.70 | 141.3 | 0.88 | ... | ... | ... | 10 | β |
| 1898.82 | 140.2 | 1.00 | ... | ... | ... | 10 | A |

A and B

| | | | | | | | |
|---------|-------|------|-----|-----|-----|----|---------|
| 1878.53 | 202.1 | 5.30 | ... | ... | ... | 10 | β |
| 1898.74 | 201.3 | 5.25 | ... | ... | ... | 10 | β |
| 1898.82 | 258.4 | 6.55 | ... | ... | ... | 29 | A |

Discovered with the 26-inch at the Naval Observatory. In the field with ν Cygni (O Σ 433), 24' γ and 1.7 η .

[β (v)... β (*Mon. Not. XXXV*, 31)... β (3114)... β (*Pub. L. O. II*)... β (Cin³...Cin⁴...Cin⁵...Cin⁶...LM...See (3496)...Doolittle (*Pub. Flower Obs.*, 1)...]

 β 1140. O. Arg. N. 22000

R. A. 21^h 14^m 19^s ϵ
Decl. — 58° 00' 3"

| | | | | | | | |
|---------|-------|------|-----|-----|-----|----|---------|
| 1889.58 | 276.5 | 3.89 | ... | ... | ... | 39 | β |
| 1893.80 | 274.1 | 4.40 | ... | ... | ... | 29 | Bar |
| 1898.31 | 276.6 | 3.86 | ... | ... | ... | 29 | β |

Discovered with the 36-inch. This star is surrounded by a faint nebula, about 12' in diameter, discovered by BARNARD by means of photography (*Mon. Not. LIX*, 369).

[β (v)... β (*Mon. Not. XXXV*, 31)... β (3114)... β (*Pub. L. O. II*)...Barnard (*A. J.*, 147)...]

 β 838. Lalande 54702

R. A. 21^h 13^m 53^s ϵ
Decl. — 52° 27' 3"

| | | | | | | | |
|---------|-------|------|-----|-----|-----|----|------------|
| 1881.00 | 99.3 | 1.29 | ... | ... | ... | 39 | β |
| 1884.05 | 93.8 | 1.84 | ... | ... | ... | 29 | H Σ |
| 1886.84 | 93.0 | 1.69 | ... | ... | ... | 39 | UI |
| 1887.77 | 95.8 | 1.74 | 8.2 | ... | ... | 39 | Cin |
| 1891.88 | 96.7 | 1.34 | 8.3 | ... | ... | 39 | β |
| 1893.39 | 97.1 | 1.48 | ... | ... | ... | 39 | W |
| 1894.57 | 101.1 | 1.82 | ... | ... | ... | 39 | Bar |
| 1894.87 | 101.1 | 1.22 | ... | ... | ... | 39 | S β |
| 1898.74 | 101.1 | 1.39 | ... | ... | ... | 19 | Low |
| 1898.80 | 98.7 | 1.60 | ... | ... | ... | 39 | Lv |
| 1898.74 | 101.1 | 1.39 | ... | ... | ... | 39 | A |
| 1898.82 | 101.1 | 1.68 | ... | ... | ... | 19 | Br |

Discovered with the 35.6-inch at the Washington Observatory.

[β (v)... β (*Mon. Not. XXXV*, 31)... β (3114)... β (*Pub. L. O. II*)...Barnard (*A. J.*, 147)...Collins (*Proc. Haverford Coll. Obs.*, 1892)...See (3496)...Scott (*Mon. Not. LIX*, 427)...]

β 1202. Lacaille 11173

R.A. 21^h 18^m 20^s.7
Decl. - 38° 20' 3"

| | | | | | | |
|---------|-------|------|-----|-----|----------------|---------|
| 1876.47 | 174.7 | 2.05 | 8.0 | 9.4 | 3 ^u | Cin |
| 1880.74 | 174.7 | 2.05 | 8.0 | 9.2 | 2 ^u | LM |
| 1880.74 | 174.5 | 2.05 | 8.3 | 9.0 | 3 ^u | β |
| 1897.72 | 112.3 | 1.98 | ... | ... | 3 ^u | A |

Discovered with the 6-inch in 1873. The double, H¹ N. 139, is undoubtedly identical with this pair. H¹ has no measures or description beyond giving it as Class I, and his place is some distance *sf*, but there is no double star there, and he probably saw the pair given above. There seems to be no relative motion.

[β (XVIII)... β (3113)... β (Pub. L. O. II)...Cin?...Cin?...Cin...LM...Aitken (*A. J.* 429)...]

 β 446. W. & N. 1314

R.A. 21^h 17^m 44^s.7
Decl. - 31° 40' 3"

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1876.80 | 201.7 | 2.30 | 8.0 | ... | 1 ^u | β |
| 1880.93 | 201.4 | 2.26 | 8.5 | 12.5 | 3 ^u | W |
| 1898.22 | 200.4 | 2.05 | 8.4 | 11.3 | 1 ^u | D |

Discovered with the 18½-inch. In the field with a 7th star.

[β (I)... β (*Am. Jour. Sci.* July 1877)...Wilson ()
Doolittle (*Pub. Flower Obs.* 1)...]

 β 830. D. M. 1257, 1313

R.A. 21^h 17^m 16^s.7
Decl. - 26° 44' 3"

A 601 B

| | | | | | | |
|---------|-------|-------|-----|--------|----------------|---------|
| 1881.47 | 201.7 | 2.13 | 8.2 | 12.0 | 3 ^u | β |
| 1892.86 | 200.8 | 14.45 | 8 | ... 12 | 1 ^u | Ho |
| 1897.61 | 199.5 | 13.01 | 7.2 | 11.5 | 1 ^u | β |

A 601 C

| | | | | | | |
|---------|-------|-------|--------|-----|----------------|---------|
| 1881.47 | 199.5 | 13.01 | ... | 9.4 | 3 ^u | β |
| 1887.85 | 197.8 | 21.43 | 8.0... | 9.8 | 3 ^u | Com |
| 1897.61 | 199.5 | 13.01 | ... | 9 | 1 ^u | Ho |
| 1898.61 | 199.5 | 13.01 | ... | 7.8 | 1 ^u | β |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (XIII)... β ...Comstock (*Pub. Washburn Obs.* VI)...Hough
(*Pub. Washburn Obs.* VI)...]

 β 766. θ *Microscopii*

R.A. 21^h 16^m 48^s.7
Decl. - 41° 31' 3"

| | | | | | | | |
|---------|-------|------|-----|-----|-----|----------------|---------|
| 1879.73 | 311.1 | 0.83 | 5 | ... | 6 | 2 ^u | β |
| 1880.71 | 302.0 | ... | 6 | ... | 7 | 1 ^u | Pol |
| 1880.43 | 307.1 | 1.06 | 5 | ... | 7 | 1 ^u | β |
| 1884.70 | 292.3 | 0.63 | 6 | ... | 7 | 2 ^u | Sel |
| 1896.81 | 281.7 | 0.94 | 7 | ... | 8 | 3 ^u | See |
| 1896.81 | 286.1 | 0.86 | ... | ... | ... | 1 ^u | Cg |
| 1897.79 | 272.7 | 0.98 | ... | ... | ... | 1 ^u | See |
| 1898.79 | 293.4 | 1.08 | 5 | ... | 7 | 2 ^u | A |

Discovered with the 6-inch at Mt. Hamilton in 1879. Some change in the angle is very probable.

[β (XI)... β ... β (2957)... β (Pub. L. O. 1, II)...Pollock (*Pub. Mount. Obs.*, 1861 (*Mon. Not. M.A.S.*), 173)...Selous (3303)
See 3446...Aitken (3585)...]

 β 1035. R.A.C. 7422

R.A. 21^h 17^m 16^s.7
Decl. - 26° 44' 3"

| | | | | | | |
|---------|-------|------|--------|------|----------------|---------|
| 1888.74 | 198.7 | 1.05 | 8.0 | 10.7 | 3 ^u | β |
| 1898.72 | 205.6 | 1.21 | 8.5... | 11.0 | 1 ⁿ | Cg |
| 1898.74 | 207.0 | 1.09 | 8.0 | 10.3 | 3 ^u | A |

Discovered with the 12-inch. Apparently angular motion.

[β (XV)... β (2875)... β (*Pub. L. O. II*)...Aitken (3585)
Cogshall ()...]

 β 272. Lacaille 11564

R.A. 21^h 17^m 56^s.7
Decl. - 13° 19' 3"

| | | | | | | | |
|---------|-------|------|-----|-----|------|----------------|-----|
| 1876.16 | 253.8 | 4.52 | 9.3 | ... | 11.3 | 3 ^u | J |
| 1878.71 | 256.0 | 4.57 | 8.2 | ... | 12.0 | 2 ^u | Cin |
| 1879.79 | 255.7 | 4.31 | 8.0 | ... | 12.6 | 1 ^u | Cin |
| 1892.69 | 255.5 | 4.97 | 8.5 | ... | 11.7 | 3 ^u | W |
| 1898.61 | 256.8 | 4.81 | 8.9 | ... | 9.8 | 4 ^u | D |

Discovered with the 6 inch. In the field with 18 *Aquarii*.

[β (XV)... β (*Mon. Not. M.A.S.*), 41)...J (I)...Cin?...Cin?...
Wilson ()...Doolittle (*Pub. Flower Obs.* 1)...]

β 447. *Unipolus* 129R.A. 21^h 18^m 47^s 6
Decl. +21 48 5

| | | | | | | |
|---------|-------|------|--------|------|----------------|-----|
| 1878.21 | 330.4 | 8.54 | 6.5... | 12.5 | 2 ⁿ | β |
| 1881.67 | 331.1 | 9.14 | 6.0... | 12.5 | 1 ⁿ | Ho |
| 1885.66 | 329.9 | 8.62 | ... | ... | 2 ⁿ | 11Σ |
| 1892.80 | 330.7 | 9.41 | 6.0... | 12.0 | 1 ⁿ | Ho |
| 1898.63 | 330.2 | 8.74 | 6.3... | 13.0 | 3 ⁿ | Bd |
| 1898.73 | 328.3 | 8.91 | 6.2... | 12.3 | 3 ⁿ | A |

Discovered with the 18½-inch. Fixed. La lalande 41637.

[β (ix)...β (Mon. Not. XXXVIII, 78)...β...Hough (2978, 3234)...Boothroyd ()...Aitken (3585)...H2 ()...]

β 164. Lalande 41645R.A. 21^h 16^m 14^s 7
Decl. + 81 52 3

A and B

| | | | | | | |
|---------|-------|------|--------|-----|----------------|------|
| 1874.40 | 244.8 | 0.64 | ... | ... | 1 ⁿ | New |
| 1875.48 | 241.6 | 0.57 | 8.0... | 8.5 | 3 ⁿ | J |
| 1877.72 | 237.3 | 0.82 | 8.0... | 8.5 | 1 ⁿ | β |
| 1878.60 | 62.6 | 0.50 | 7.5... | 8.0 | 1 ⁿ | OΣ |
| 1886.69 | 63.0 | 0.78 | ... | ... | 6 ⁿ | 11Σ |
| 1886.78 | 237.6 | 0.68 | 8.0... | 8.1 | 2 ⁿ | LM |
| 1890.69 | 240.2 | 0.50 | 7.6... | 7.8 | 3 ⁿ | β |
| 1891.70 | 240.0 | 0.57 | 8.0... | 8.5 | 4 ⁿ | T |
| 1895.70 | 244.4 | 0.53 | 7.6... | 7.6 | 3 ⁿ | Cole |
| 1896.73 | 246.0 | ... | ... | ... | 1 ⁿ | Cole |
| 1898.68 | 238.0 | 0.70 | 7.5... | 7.5 | 3 ⁿ | A |

AB and C (= Σ 2793)

| | | | | | | |
|---------|-------|-------|--------|-----|----------------|------|
| 1828.80 | 242.2 | 26.51 | 7.0... | 8.7 | 3 ⁿ | Σ |
| 1842.89 | 241.5 | ... | ... | ... | 1 ⁿ | Ma |
| 1865.14 | 241.2 | 26.62 | 6.8... | 9.0 | 3 ⁿ | J |
| 1878.60 | 242.5 | 26.40 | ... | 8.7 | 1 ⁿ | OΣ |
| 1890.69 | 241.5 | 26.99 | ... | 8.7 | 3 ⁿ | β |
| 1892.81 | 243.0 | 26.66 | 6.5... | 8.5 | 2 ⁿ | Gl |
| 1895.70 | 240.8 | 26.86 | ... | ... | 5 ⁿ | Cole |
| 1898.68 | 241.8 | 26.69 | ... | ... | 3 ⁿ | A |

The principal star of the wide pair, Σ 2793, was found to be a close pair with the 6-inch. The change, if any, is very slow. The distant star is fixed. All the measures of C are given.

[β (iii)...β (Mon. Not. XXXIX, 56)...β (1873)...J. O. H...Newcomb (1871)...J. O. H...]

511)...J (2086)...LM...OΞ (Poulkova Obsmt. X)...Tarrant (3186)...HΣ ()...Aitken (3585)...Glase-napp (ii)...Madler (Fixstern-Systeme 1)...Coleman (Mon. L. J. 8, 110)

β 767. Lacaille 8809R.A. 21^h 17^m 12^s 4
Decl. - 45 1 3

| | | | | | | |
|---------|-------|------|--------|------|----------------|----------------|
| 1879.70 | 146.1 | 3.40 | 6.0... | ... | 2 ⁿ | β |
| 1887.43 | 143.9 | 3.22 | 6... | ... | 4 ⁿ | 1 ⁿ |
| 1890.94 | 142.6 | 2.73 | 6... | 8 | 5 ⁿ | Sel |
| 1898.66 | 144.1 | 3.18 | 6.0... | 10.0 | 3 ⁿ | A |
| 1898.72 | 145.6 | 3.07 | 6.5... | 11.5 | 2 ⁿ | 1 ⁿ |

Discovered with the 6-inch at Mt. Hamilton in 1879. In Cord. G. C. 6m (*Microscopium*).

[β (xi)...β...Pollock (Pub. Sydney Obsv. 1891) (Mon. Not. XLVII, 473) (Mem. R. A. S. L.)...Sellers (3154)...Aitken (3585)...Cogshall ()...]

β 683. Lalande 41683R.A. 21^h 26^m 45^s 9
Decl. - 28 41 3

| | | | | | | |
|---------|-------|--------|--------|------|----------------|-----|
| 1877.53 | 198.4 | 2.04 | 8.5... | 11.2 | 1 ⁿ | β |
| 1879.79 | 197.3 | 2.5... | 8.5... | 12.0 | 1 ⁿ | Cin |
| 1882.71 | 193.1 | 1 | 7.0... | 12.0 | 1 ⁿ | W |
| 1892.79 | 193.2 | 2.89 | 8.0... | 11.1 | 1 ⁿ | Ho |
| 1898.69 | 194.6 | 2.67 | 8.2... | 12.0 | 2 ⁿ | Bd |
| 1898.71 | 195.1 | 3.01 | 8.0... | ... | 3 ⁿ | A |

Discovered with the 18½-inch. While the relative change is small, the components have a common proper motion of 0.125 in the direction of 154.2° (PORTER), and therefore form a physical system.

[β (x)...β (1873)...W. W. C. (1873)...Boothroyd ()...Aitken (3585)...]

β 1141. O. Aitken N. 2227R.A. 21^h 22^m 0^s 9
Decl. - 87 34 3

| | | | | | | |
|---------|-------|------|--------|------|----------------|---|
| 1880.58 | 165.0 | 2.72 | 7.7... | 13.2 | 2 ⁿ | β |
| 1898.68 | 171.9 | 3.13 | 7.7... | 13.8 | 2 ⁿ | A |

Discovered with the 36-inch.

[β (xvi)...β (2056)...β (Pub. L. O. 11)...Aitken (3585)...]

β 300. *W. XXII 300*

R.A. $20^h 27^m 52^s$
Decl. $-3^{\circ} 45' 12''$

| | | | | |
|--------|------|------|----|---------------|
| 1888.1 | 11.3 | 19.3 | 36 | 11 Σ |
| 1888.1 | 11.9 | 19.2 | 33 | 3 m β |

Discovered with the 6-inch. The 36-inch shows a third star 14m, a little farther from A than this, in the direction of 330° .

[*Mon. Not. XXXVIII*, 1876, 2, 111] 11 Σ

 β 72. *W. XXI 72*

R.A. $20^h 27^m 28^s$
Decl. $-3^{\circ} 33' 3''$

| | | | | | |
|---------|------|------|--------|------|---------------|
| 1871.5 | 15.2 | 1.52 | 9.0... | 11.2 | 3 m β |
| 1875.7 | 14.3 | 1.52 | | | 2 m β |
| 1878.75 | 13.7 | 1.74 | 8.0... | 11.1 | 2 m Cin |
| 1886.68 | 13.8 | 2.00 | 8.4... | 11.1 | 4 m 1.M |
| 1890.68 | 12.2 | 1.84 | 8.8 | 8.6 | 3 m β |
| 1899.77 | 14.1 | 1.94 | 9.0... | 11.5 | 2 m 1 |
| 1897.74 | 37.6 | 1.89 | | | 3 m A |

Discovered with the 6-inch. β Aquarii is 11.2 m , and β 684 in the field.

[*Publ. Obs. Greenwich*, 1851, 3, β (3048)... β / *Publ. L. O. II*... β (1)...Cin...L.M. Tarrant (3186)...*Astr. J.*, 1891]

 β 684. *W. XXI 684*

R.A. $20^h 27^m 38^s$
Decl. $-3^{\circ} 32' 3''$

| | | | | | |
|---------|------|------|--------|------|---------------|
| 1870.5 | 13.1 | 1.11 | 9.0... | 9.62 | 3 m β |
| 1875.1 | 12.5 | 1.30 | 9.1 | 9.8 | 2 m 1.M |
| 1890.68 | 12.6 | 1.12 | 8.7... | 8.9 | 3 m β |
| 1890.68 | 10.1 | 1.39 | | | 3 m A |

Discovered with the 18½-inch. In the field with β 72. Angular motion is probable.

[*Mon. Not. XXXVIII*, 1876, 2, 111] β / *Publ. L. O. II*... β (1)...Cin...L.M. Tarrant (3186)...*Astr. J.*, 1891]

 β 685. *W. XXI 685*

R.A. $20^h 28^m 14^s$
Decl. $-6^{\circ} 6' 3''$

| | | | | | |
|---------|-------|-------|--------|------|---------------|
| 1870.5 | 11.3 | 14.3 | 11 | 11.2 | 2 m β |
| 1893.68 | 332.4 | 29.58 | 5.0... | 12.8 | 1 m W |
| 1893.68 | 11.3 | 14.3 | | | 2 m 1 |

Discovered with the 18½-inch. The principal star has a proper motion of 0.15 in the direction of $82^{\circ} 5'$ (AUWERS).

[*Mon. Not. XXXVIII*, 1876, 2, 111] β / *Publ. L. O. II*... β (1)...Cin...L.M. Tarrant (3186)...*Astr. J.*, 1891]

 β 448. *D. M. (14) 3832*

R.A. $20^h 24^m 36^s$
Decl. $-11^{\circ} 24' 3''$

A double star, supposed to be in this place, was found with the 18½-inch October 1876, and the distance estimated 2", and the magnitudes 7 and 11. I could not see this star double with the 18½-inch in 1879, nor with the 36-inch in 1891. H Σ found it single in 1885. There is no obvious error in the original entry, nor any doubt noted as to the existence of the companion. The magnitude of this star is 6.4 in A.G.C.

[β (1X)... β (*Mon. Not. XXXVIII*, 1876, 2, 111) H Σ ()...]

 β 1142. *D. M. (50) 2579*

R.A. $20^h 28^m 7^s$
Decl. $-1^{\circ} 50' 39''$

| | | | | | |
|---------|-------|------|--------|-----|---------------|
| 1889.50 | 353.9 | 0.41 | 8.7... | 8.7 | 3 m β |
| 1898.80 | 350.0 | 0.44 | 9.3... | 9.3 | 3 m A |

Discovered with the 36-inch.

[β (xvi)... β (2956)... β (*Publ. L. O. II*)...Aitken (3585)...]

 β 73. *β Aquarii*

R.A. $20^h 28^m 14^s$
Decl. $-6^{\circ} 6' 3''$

A and C

| | | | | | |
|---------|-------|-------|-----|------|---------------|
| 1879.57 | 184.9 | 54.54 | ... | 11.5 | 3 m β |
| 1893.82 | 185.0 | 54.95 | ... | 11.5 | 3 m W |
| 1898.63 | 184.6 | 55.97 | ... | 11.2 | 3 m Cg |
| 1898.90 | 185.4 | 55.73 | ... | 12.0 | 1 m β |

A and B (= H 636)

| | | | | | | |
|---------|-------|-------|---|---------|-------|---------|
| 1878 | 322.8 | 29 | 3 | .. 15 | 1 m | H |
| 1879.31 | 318.9 | 34.26 | | .. 15.9 | 2 m | β |
| 1893.82 | 318.5 | 34.92 | | .. 15.9 | 3 m | W |
| 1898.63 | 318.4 | 34.96 | | .. 16.5 | 3 m | Cg |
| 1898.90 | 319.1 | 34.72 | | .. 15.9 | 1 m | β |

The faint companion was noted with the 6-inch. All the measures of the HERSCHEL star are given. These stars are not likely to have any connection with the large star. The proper motion is very small, 0.009 in the direction of 263°6.

[β (II)... β (Mon. Not. XXXII, 551)... β ...Wilson ()
...Cogshall ()...]

 β 165. Lalande 41951

R.A. 21^h 27^m 55^s t
Decl. - 3° 59' λ

| | | | | | | |
|---------|-------|------|--------|------|----------------|-------|
| 1876.10 | 176.0 | 4.77 | 8.7... | 10.8 | 3 ^m | J |
| 1879.29 | 176.7 | 4.82 | 8.0... | 10.5 | 2 ^m | Cin |
| 1888.82 | 176.5 | 5.04 | 8.5... | 10.8 | 1 ^m | Lv |
| 1890.77 | 179.3 | 4.96 | ... | ... | 1 ^m | Byers |
| 1890.77 | 174.3 | 4.42 | 8.7... | 11.0 | 2 ^m | T |
| 1898.51 | 176.5 | 5.08 | 8.6... | 9.8 | 4 ^m | D |

Discovered with the 6-inch. Probably fixed.

[β (III)... β (Mon. Not. XXXIV, 59)...J (I)...Cin⁵...Cin⁶...
Lv⁴...Byers (Proc. Haverford Coll. Obs., 1891)...Tar-
rant (3186)...Doolittle (Pub. Flower Obs., 1)...]

 β 370. O. Arg. N. 22429

R.A. 21^h 28^m 15^s t
Decl. + 52° 13' λ

| | | | | | | |
|---------|-------|------|--------|-----|----------------|----|
| 1876.77 | 320.5 | 3.46 | 8.5... | 9.0 | 4 ^m | J |
| 1880.82 | 325.5 | 3.59 | ... | ... | 1 ^m | Pt |
| 1892.77 | 328.0 | 3.69 | 8.5... | 9.4 | 4 ^m | W |
| 1898.60 | 326.7 | 3.68 | 8.7... | 9.0 | 4 ^m | D |

Discovered with the 6-inch. ROGERS gives the proper motion, 0.045 in 90°.

[β (VI)... β (2092)...J (I)...Pritchett (Proc. Maxson Obs.,
1)...Wilson ()...Doolittle (Pub. Flower Obs., 1)...]

 β 273. W. XXI. 646

R.A. 21^h 28^m 13^s t
Decl. + 10° 55' λ

| | | | | | | |
|---------|------|------|--------|------|----------------|---------|
| 1875.84 | 93.1 | 5.77 | 8.1... | 12.0 | 4 ^m | J |
| 1879.97 | 92.4 | 5.84 | 8.0... | 11.5 | 3 ^m | β |
| 1898.50 | 90.9 | 6.13 | 8.7... | 10.5 | 3 ^m | D |
| 1898.84 | 92.9 | 5.73 | 8.0... | 10.5 | 1 ^m | β |

Discovered with the 9.4-inch at the Dartmouth College Observatory. Unchanged.

[β (V)... β (Mon. Not. XXXV, 31)... β ... β ...J (I)...Doo-
little (Pub. Flower Obs., 1)...]

 β 74. Lalande 42052

R.A. 21^h 29^m 46^s t
Decl. + 20° 52' λ

| | | | | | | |
|---------|-------|------|--------|-----|----------------|------------|
| 1874.67 | 321.4 | 1.54 | 7.0... | 9.0 | 1 ^m | O Σ |
| 1876.09 | 319.5 | 1.43 | 7.1... | 9.0 | 5 ^m | J |
| 1882.68 | 325.0 | 1.6 | 6.5... | 1.0 | 1 ^m | Perry |
| 1884.38 | 321.7 | 1.62 | ... | ... | 3 ^m | H Σ |
| 1893.53 | 319.9 | 1.32 | 7.3... | 8.9 | 3 ^m | Lv |

Discovered with the 6-inch. No relative motion.

[β (I)... β (Mon. Not. XXXIII, 351)...O Σ (Poulkova Obs., X)
...J (I)...Perry (Eng. Mech. XXXVI, 65)...Lv (A. J.
382)...H Σ ()...]

 β 166. O. Arg. N. 22487

R.A. 21^h 30^m 17^s t
Decl. + 59° 48' λ

| | | | | | | |
|---------|-------|------|--------|------|----------------|------------|
| 1875.54 | 259.3 | 1.16 | 7.4... | 10.2 | 4 ^m | J |
| 1885.52 | 254.1 | 1.31 | ... | ... | 2 ^m | H Σ |
| 1893.77 | 250.6 | 1.44 | 7.8... | 11.0 | 2 ^m | W |
| 1898.57 | 256.9 | 1.46 | 8.7... | 10.5 | 3 ^m | D |

Discovered with the 6-inch.

[β (III)... β (Mon. Not. XXXIV, 59)...J (I)...Wilson ()...
H Σ ()...Doolittle (Pub. Flower Obs., 1)...]

 β 167. Cygni 363

R.A. 21^h 31^m 28^s t
Decl. + 20° 31' λ

| | | | | | | |
|---------|------|------|--------|------|----------------|------------|
| 1876.48 | 89.2 | 2.08 | 7.0... | 11.4 | 4 ^m | J |
| 1881.73 | 88.0 | 1.97 | 7.0... | 11.0 | 3 ^m | H Σ |
| 1882.68 | 91.0 | 2.17 | ... | ... | 1 ^m | Perry |
| 1885.66 | 92.2 | 2.33 | ... | ... | 2 ^m | H Σ |
| 1893.66 | 88.9 | 2.10 | 6.5... | 10.8 | 2 ^m | W |

Discovered with the 6-inch. Without change.
Piazzi XXI. 215.

[β (III)... β (Mon. Not. XXXIV, 59)...J (I)...Perry (Eng.
Mech. XXXVI, 65)...Hough (2078)...Wilson ()...H Σ
()...]

β 371. α A α N 225R.A. 21^h 32^m 58^s .4
Decl. - 85° 13' A

| | | | | | |
|---------|-----|------|-----|-------|------------------|
| 1870.58 | 4.0 | 8.3 | 8.2 | 110.7 | 3 ^m J |
| 1892.82 | 4.2 | 8.33 | 8.5 | 110.2 | 3 ^m W |
| 1904.19 | 4.2 | 8.38 | 8.2 | 110.1 | 4 ^m D |

Discovered with the 6-inch.

[Barnard (1894)...Wilson ()...Franz (2649)...Aitken (1895)...Brown ()...]

 β 1212. α A α 220R.A. 21^h 32^m 20^s .4
Decl. - 85° 13' A

A and B

| | | | | | |
|---------|-------|------|--------|-----|------------------------|
| 1890.75 | 254.5 | 4.5 | 6.5... | 6.9 | 3 ^m β |
| 1891.55 | 261.0 | 4.5 | 6.3... | 7.1 | 4 ^m β |
| 1892.40 | 256.2 | 0.38 | | | 2 ^m Sp |
| 1893.68 | 260.5 | 0.32 | 7.1... | 7.8 | 3 ^m W |
| 1893.88 | 262.8 | 0.59 | | | 1 ^m Bar |
| 1894.82 | 264.7 | 0.52 | | | 7 ^m Bar |
| 1894.86 | 261.5 | 0.45 | | | 3 ^m Sp |
| 1897.81 | 260.5 | 0.65 | | | 3 ^m A |
| 1897.89 | 267.4 | 0.73 | | | 1 ^m Br |
| 1898.78 | 269.0 | 0.49 | 6.5... | 6.6 | 3 ^m A |
| 1898.84 | 269.0 | 0.51 | | | 1 ^m β |

AB and C

| | | | | | |
|---------|-------|-------|-------|----------------|---------|
| 1891.76 | 141.0 | 44.4 | 100.0 | 200 | β |
| 1893.83 | 141.2 | 44.5 | 100.5 | 200 | W |
| 1897.89 | 144.3 | 44.3 | | 1 ^m | Br |
| 1898.84 | 142.7 | 43.33 | 100.9 | 200 | β |

Discovered with the 36-inch. It was evident at the time of discovery that the close pair was a binary from the common proper motion of the components, as otherwise the duplicity would have been seen long ago. This proper motion is given by AUWERS as 0".215 in the direction of 82°.5. This corresponds, as might be expected, to the change in the distant star C. The motion of AB is slow so far, but it is probable that the components have about the maximum separation at this time, and that hereafter the angular motion will be more rapid.

[...Sp (111)...Barnard (A. J. 447)...Aitken (A. J. 429)
...Aitken (1895)...Brown ()...]

 β 686. Radcliffe 5329R.A. 21^h 34^m 14^s .9
Decl. - 85° 13' A

A and B

| | | | | | |
|---------|-------|------|-----|------|----------------------------|
| 1877.58 | 117.5 | 0.4 | | | 1 ^m β |
| 1877.78 | 127.9 | 0.48 | 7.7 | 8.0 | 1 ^m J |
| 1885.52 | 296.5 | 0.80 | | | 1 ^m 11 Σ |
| 1893.57 | 303.7 | 0.87 | 8.5 | 11.0 | 1 ^m W |
| 1898.70 | 289.9 | 0.87 | 8.0 | 13.0 | 1 ^m A |

AB and C (= O Σ Apg. 220)

| | | | | | |
|---------|------|-------|-----|-----|------------------------|
| 1875.06 | 11.0 | 41.22 | 8.3 | 8.3 | 3 ^m J |
| 1878.65 | 11.0 | 41.67 | | | 1 ^m β |
| 1883.23 | 10.9 | 41.53 | 8.1 | 8.0 | 1 ^m Fr |
| 1893.57 | 10.9 | 41.05 | | 9.5 | 1 ^m W |

The duplicity of the principal star of this wide pair was discovered with the 18½-inch. It is a difficult pair, and likely to prove an interesting one. The estimated magnitudes of B are very discordant. The foregoing are all the measures of C. This star is Radcliffe 5330.

[A. J. 430...Wilson ()...Franz (2649)...Aitken (1895)...11 Σ ...]

 β 449. Radcliffe 5335R.A. 21^h 34^m 32^s .4
Decl. - 85° 13' A

A and B

| | | | | | | |
|---------|------|------|-----|------|-------|---------|
| 1876.86 | 19.1 | 6.78 | . | . | 1 n | β |
| 1891.51 | 15.6 | 6.09 | 7.1 | 12.7 | 3 n | β |
| 1898.69 | 14.5 | 6.13 | . | . | 2 n | Hu |

A and D

| | | | | |
|---------|-------|-------|-------|------------------------|
| 1876.80 | 248.2 | 17.94 | | 1 ^m β |
| 1889.94 | 239.6 | 15.70 | 11.13 | 1 ^m Ho |
| 1891.51 | 247.2 | 17.45 | 12.1 | 2 ^m β |

A and C (= H β III, 110... O Σ 117)

| | | | | | |
|---------|-------|-------|--------------|----------------|------------|
| 1783.81 | 177.6 | 13.96 | ... | 1 ^m | H β |
| 1848.30 | 169.4 | 13.96 | 7.6 ... 11.1 | 1 ^m | O Σ |
| 1866.58 | 170.5 | 13.69 | 7.6 ... 10.8 | 3 ^m | J |
| 1889.94 | 170.5 | 13.81 | ... 11.6 | 1 ^m | Ho |
| 1891.51 | 172.2 | 13.61 | ... 11.6 | 2 ^m | β |
| 1894.66 | 171.2 | 13.61 | 7.1 ... 11.6 | 2 ^m | Cl |

A and E

| | | | | |
|---------|------|-------|------------|----------------|
| 1783.81 | 49.4 | 25.97 | 1 <i>n</i> | H ⁺ |
| 1848.30 | 45.3 | 29.00 | 7.9 | 4 <i>n</i> OΣ |
| 1866.58 | 45.7 | 29.12 | 7.7 | 3 <i>n</i> J |
| 1889.94 | 45.1 | 28.85 | 8.0 | 1 <i>n</i> H6 |
| 1891.51 | 44.6 | 28.95 | 7.2 | 3 <i>n</i> β |
| 1894.66 | 44.9 | 28.92 | 7.9 | 2 <i>n</i> G1 |

The two small stars, B and D, were noted with the 18½-inch. The brighter stars, ACE, make H' III. 110 = OΣ 447. They are relatively fixed. All the measures are given.

[β (xvi)...β (2956) S. W. Burn. 1877. J. β (3111)...β (Pub. L. O. II)...Hough 1878. J. Hussey 1881. OΣ (Pub. 1882) Oβ (1883) J. D. Glasenapp (III).]

β 687. Radcliffe 5340

R.A. 21^h 34^m 53^s J
Decl. +55° 15' A

| | | | | | | |
|---------|-----|------|--------|-----|------------|----|
| 1878.65 | 8.4 | 0.89 | 8.0... | 9.0 | 1 <i>n</i> | β |
| 1885.55 | 4.4 | 0.66 | | | 3 <i>n</i> | HΣ |
| 1890.74 | 4.9 | 0.64 | | | 9 <i>n</i> | Sp |
| 1893.70 | 1.8 | 0.76 | 7.2... | 9.0 | 2 <i>n</i> | W |
| 1898.65 | 2.5 | 0.83 | 7.7 | 9.3 | 4 <i>n</i> | A |

Discovered with the 18½-inch. My first angle was printed 1887.4. An examination of the original record shows that it should have been as given here.

[β (xvi)...β (Sp. III) Wilson () Aitken 1884 HΣ ()...]

β 1143. Piazz1 XXI. 248

R.A. 21^h 35^m 14^s J
Decl. +56° 37' A

A and E

| | | | | | | |
|---------|-------|------|--------|------|------------|---|
| 1889.62 | 323.5 | 1.55 | 6.0... | 13.7 | 3 <i>n</i> | β |
| 1898.75 | 325.0 | 1.73 | 6.3... | 14.0 | 2 <i>n</i> | A |

A and C (= Σ 2816)

| | | | | | | |
|---------|-------|-------|--------|-----|------------|---|
| 1832.94 | 120.1 | 11.66 | 6.3... | 7.9 | 3 <i>n</i> | Σ |
| 1860.05 | 121.2 | 11.77 | 4.8... | 7.8 | 3 <i>n</i> | J |
| 1889.61 | 120.4 | 11.86 | | 7.3 | 3 <i>n</i> | β |
| 1898.87 | 120.7 | 11.60 | | | 1 <i>n</i> | A |

A and D (= Σ 2816)

| | | | | | | |
|---------|-------|-------|--|-----|------------|---|
| 1832.94 | 359.7 | 19.99 | | 7.5 | 3 <i>n</i> | Σ |
| 1866.65 | 339.8 | 19.81 | | 7.5 | 3 <i>n</i> | J |
| 1889.61 | 339.5 | 19.94 | | 7.3 | 3 <i>n</i> | β |
| 1898.87 | 339.4 | 20.15 | | | 1 <i>n</i> | A |

The close companion to the principal star of the wide triple Σ 2816 (= H' III. 71 = S 795) was discovered with the 36-inch. It is probably too difficult for any of the instruments with which the other stars have been observed. The old components appear to be relatively fixed. AUWERS gives the proper motion of the principal star 0.0167 in the direction of 153°9. This should increase the distance of D about 1" in the interval covered by the measures. The measures indicate a common movement in space. This is a naked-eye star in *Cepheus* (= B.A.C. 7545). The Harvard photometric magnitude is 5.5.

[β (xvi)...β (2956)...β (Pub. L. O. II)...Aitken (3585)...]

There are other measures of the bright stars:

[Makiet 1 *Fundam. Astronom.* 3 *European Union* 1881...Wrottesley (*Phil. Trans.* 1851)...Radcliffe Obs. XII...D (1125)...J (1, p. 118, II)...Herschel (*Mem. R. A. S.* IV)...Noble (*Rend. Acad. Sci. Napoli*, Jan. 1875)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII)...Glasenapp (III)...]

β 372. D.M. 15. 134.3

R.A. 21^h 38^m 18^s J
Decl. +51° 1' A

| | | | | | | |
|---------|-------|------|--------|------|------------|---|
| 1876.93 | 352.7 | 1.89 | 8.5... | 12.6 | 4 <i>n</i> | J |
| 1892.69 | 352.2 | 1.83 | 8.5... | 11.5 | 2 <i>n</i> | W |

Discovered with the 6-inch. Near π Cygni, 2ⁿ ρ and 22' η .

[β (vi)...β (2062)...D (1)...Wilson ()...]

β 274. W. N. XI. 881

R.A. 21^h 30^m 20^s J
Decl. +48° 30' A

| | | | | | | |
|---------|-------|------|--------|------|------------|---|
| 1875.93 | 180.7 | 3.45 | 7.8... | 10.9 | 3 <i>n</i> | J |
| 1885.83 | 182.1 | 3.54 | | | 1 <i>n</i> | E |
| 1892.95 | 181.7 | 3.99 | 8.0... | 10.5 | 1 <i>n</i> | W |
| 1898.52 | 177.4 | 3.50 | 7.8... | 9.0 | 2 <i>n</i> | D |

Discovered with the 9.4-inch at the Dartmouth College Observatory.

[β (xvi)...β (2956)...β (3111)...Hough 1878. J. Hussey 1881. OΣ (Pub. 1882) Oβ (1883) J. D. Glasenapp (III)...Morrisson (*Obs.*, 1)...Wilson ()...Doolittle (*Pub. Flower Obs.*, 1)...]

β 373-

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

| | | | | | |
|---------|-------|------|------|------|------------------|
| 1873.68 | 191.1 | 4.32 | 10.1 | 10.0 | 3 ^u J |
| 1874.25 | 191.1 | 4.05 | 10.0 | 10.8 | 3 ^u W |
| 1875.52 | 190.7 | 4.42 | 10.8 | 11.8 | 2 ^u D |

Discovered with the 6-inch. The south star of a wide pair.

Discovered by J. G. Cooper (1873) ... Antken (1885).
[The motion (1873) ...]

 β 688.

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

| | | | | | |
|---------|-------|------|-----|-----|---------------------------|
| 1878.36 | 208.7 | 4.35 | 7.6 | 7.6 | 5 ^u β |
| 1884.05 | 201.4 | 4.38 | ... | ... | 3 ^u H Σ |
| 1885.71 | 207.1 | 4.3 | 8.1 | 8.1 | 1 ^u Ho |
| 1890.13 | 202.6 | 4.4 | ... | ... | 4 ^u Sp |
| 1891.54 | 204.5 | 4.7 | ... | ... | 3 ^u Sp |
| 1895.54 | 200.8 | 4.32 | 7.7 | 7.7 | 3 ^u A |

Discovered with the 18½-inch. There may be slow motion in angle. This star is a short distance

from β 689.
[The motion (1873) ...] Antken (1885).
H Σ (...)

 β 1263.

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

| | | | | | |
|---------|-------|------|-----|------|------------------------|
| 1891.60 | 212.6 | 0.48 | 8.5 | 10.2 | 3 ^u β |
| 1893.68 | 220.3 | 0.45 | ... | ... | 1 ^u β |

Discovered with the 36-inch. β 689 is 3" f and ...

Discovered by J. G. Cooper (1873) ... Antken (1885).

 β 689.

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

| | | | | | |
|---------|-------|------|-----|------|---------------------------|
| 1878.37 | 240.5 | 1.80 | 7.5 | 10.1 | 3 ^u β |
| 1885.69 | 237.2 | 1.68 | ... | ... | 2 ^u H Σ |
| 1891.60 | 241.6 | 1.71 | 7.3 | 11.4 | 5 ^u β |
| 1893.68 | 240.8 | 2.56 | 7.0 | 10.0 | 1 ^u A |

Discovered with the 18½-inch. Lalande 42384.

Discovered by J. G. Cooper (1873) ... Antken (1885).
[The motion (1873) ...]

 β 374- O. Arg. N. 22750

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

| | | | | | |
|---------|-------|------|-----|------|-------------------|
| 1877.33 | 143.3 | 1.86 | 8.4 | 10.3 | 5 ^u J |
| 1893.84 | 141.3 | 1.86 | 8.3 | 10.5 | 3 ^u Lv |

Discovered with the 6-inch. It is γ^0 / π^0 C γ mi, and 11" q .

[β (v1) ... β (2062) ... J (1) ... Lv (A. J. 382) ...]

 β 980. κ Pegasi

R.A. 21^h 37^m 37^s \pm 1
Decl. -3^h 42^m 32^s \pm 1

A and B

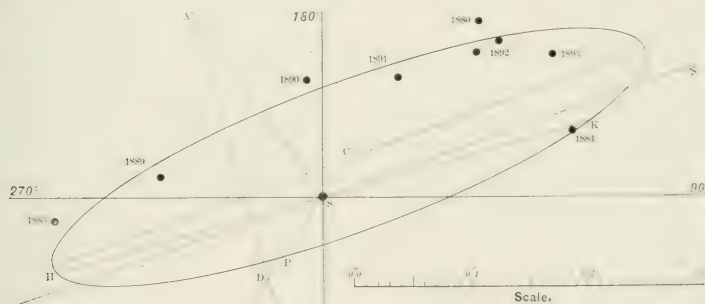
| | | | | | |
|---------|-------|------|-----|-----|-------------------------|
| 1880.68 | 137.9 | 0.25 | 4.8 | 5.3 | 4 ^u β |
| 1883.62 | 119.0 | 0.16 | ... | ... | 1 ^u En |
| 1884.61 | 140.0 | 0.25 | ... | ... | 1 ^u En |
| 1884.87 | 104.7 | 0.22 | ... | ... | 1 ^u β |
| 1887.82 | 286.8 | 0.25 | ... | ... | 1 ^u Sp |
| 1888.78 | 274.7 | 0.23 | ... | ... | 3 ^u β |
| 1888.89 | 298.9 | 0.25 | ... | ... | 3 ^u Sp |
| 1889.51 | 262.3 | 0.14 | 4.3 | 5.0 | 4 ^u β |
| 1890.57 | 187.1 | 0.10 | ... | ... | 4 ^u β |
| 1890.93 | 139.4 | ... | ... | ... | 1 ^u Sp |
| 1891.61 | 150.0 | 0.10 | ... | ... | 3 ^u β |
| 1891.81 | 144.6 | 0.13 | ... | ... | 4 ^u β |
| 1891.93 | 159.6 | 0.20 | ... | ... | 3 ^u Sp |
| 1892.39 | 132.8 | 0.18 | ... | ... | 4 ^u β |
| 1892.38 | 131.0 | 0.20 | ... | ... | 1 ^u Bar |
| 1892.97 | 135.1 | 0.20 | ... | ... | 1 ^u Sp |
| 1893.51 | 121.6 | 0.29 | 1.6 | 1.1 | 3 ^u Lv |
| 1893.76 | 127.5 | 0.20 | ... | ... | 2 ^u Bar |
| 1893.82 | 139.5 | 0.25 | ... | ... | 1 ^u Com |
| 1893.93 | 123.6 | 0.27 | ... | ... | 8 ^u Sp |
| 1894.50 | 117.6 | 0.19 | ... | ... | 5 ^u Bar |
| 1894.84 | 114.8 | 0.14 | ... | ... | 4 ^u Lew |
| 1894.88 | 114.7 | 0.25 | ... | ... | 6 ^u Sp |
| 1895.69 | 107.8 | 0.18 | ... | ... | 6 ^u Bar |
| 1895.72 | 104.3 | 0.16 | ... | ... | 2 ^u Dyon |
| 1895.74 | 104.6 | 0.12 | 3.5 | 9.9 | 7 ^u Lew |
| 1895.73 | 103.0 | ... | ... | ... | 1 ^u Christie |
| 1895.79 | 112.7 | 0.13 | ... | ... | 4 ^u Com |
| 1895.91 | 108.1 | 0.20 | ... | ... | 4 ^u Sp |
| 1896.64 | 80.9 | 0.09 | ... | ... | 6 ^u Lew |
| 1896.68 | 93.7 | 0.09 | ... | ... | 3 ^u A |
| 1897.57 | 27.0 | 0.09 | ... | ... | 4 ^u Lew |
| 1897.76 | 16.6 | ... | ... | ... | 1 ^u Lew |
| 1897.86 | 4.8 | ... | ... | ... | 1 ^u Dyon |

| | | | | | |
|---------|-------|------|-----|----------------|--------------------|
| 1897.00 | 342.0 | .. | .. | 1 ^u | Lew |
| 1898.50 | 294.5 | 0.16 | 5.7 | 5.7 | 3 ^u A |
| 1898.66 | 304.0 | 0.11 | .. | .. | 2 ^u Bar |
| 1898.68 | 300.0 | 0.28 | .. | .. | 5 ^u Lew |
| 1898.88 | 289.7 | 0.35 | .. | .. | 2 ^u Bow |
| 1898.86 | 288.9 | 0.27 | .. | .. | 4 ^u Lew |
| 1899.47 | 284.0 | 0.19 | .. | .. | 4 ^u A |

AB and C = Σ 2824

| | | | | | |
|---------|-------|-------|-----|------|-------------------------------|
| 1828 | 309.1 | .. | 4.2 | 10.7 | 2 ^u H ⁺ |
| 1831.56 | 308.5 | 11.01 | 3.9 | 10.8 | 5 ^u Σ |
| 1844.89 | 307.3 | 11.48 | .. | .. | 1 ^u Ma |
| 1848.00 | 306.5 | 11.20 | .. | .. | 2 ^u Ma |
| 1850.99 | 306.1 | 11.00 | .. | .. | 3 ^u Ma |
| 1857.45 | 305.0 | 11.86 | .. | .. | 4 ^u Ma |
| 1860.82 | 302.8 | 9.82 | .. | .. | 1 ^u Ma |
| 1862.45 | 304.8 | 11.03 | .. | 10.3 | 1 ^u Kn |

| | | | | | |
|---------|-------|-------|-----|------|-------------------------------|
| 1862.77 | 301.2 | 12.12 | .. | .. | 1 ^u M ⁺ |
| 1864.87 | 303.0 | 11.50 | 1.3 | 5 | 0 ^u J |
| 1866.61 | 301.3 | 12.03 | .. | .. | 1 ^u Hd |
| 1872.62 | 301.7 | 11.7 | 1 | 1.3 | 1 ^u WS |
| 1874.80 | 302.2 | 12.1 | 4 | 1.3 | 1 ^u Gled |
| 1875.89 | 303.3 | .. | .. | .. | 1 ^u WS |
| 1880.60 | 303.1 | 11.76 | .. | 0.3 | 1 ^u B |
| 1881.17 | 302.3 | 12.47 | .. | .. | 2 ^u Sk |
| 1888.81 | 300.6 | 12.13 | 4 | 1.3 | 1 ^u H1 |
| 1888.82 | 300.7 | 12.22 | .. | .. | 2 ^u β |
| 1888.92 | 300.8 | 11.95 | .. | .. | 2 ^u Sp |
| 1891.09 | 298.9 | 12.10 | .. | .. | 1 ^u B ⁺ |
| 1892.81 | 297.7 | 12.09 | .. | .. | 2 ^u Mau |
| 1893.66 | 297.5 | 11.86 | 3.0 | 11.1 | 2 ^u Gl |
| 1895.25 | 298.8 | 12.21 | .. | .. | 4 ^u Lew |
| 1895.60 | 301.1 | 12.28 | .. | .. | 8 ^u Bar |
| 1898.43 | 299.6 | 12.43 | .. | .. | 1 ^u A |
| 1898.71 | 298.8 | 12.45 | .. | .. | 3 ^u Lew |



(*Etoiles Doubles et Multiples*)...Maw (*Mem. R. A. S.* 11)...Hall (II)...Everett (*Mon. Not. LVI*, 464)...Bigourdan (*Bul. Ast.* XVIII)...Glazenapp (III)...Coleman (*Nem. R. A. S.* LIII)...]

β 690. *μ Cephei*

R.A. 21^h 37^m 50^s *f*
Decl. + 58° 14' *f*

A and B

| | | | | | | |
|---------|-------|-------|--------|------|------------|---|
| 1878.87 | 250.4 | 19.16 | 5.0... | 12.3 | 3 <i>m</i> | β |
| 1889.52 | 259.6 | 19.58 | 6 | 13.2 | 3 <i>m</i> | β |
| 1898.58 | 260.0 | 19.36 | | 12.6 | 2 <i>m</i> | β |

A and C

| | | | | | | |
|---------|-------|-------|--|------|------------|---|
| 1878.42 | 299.4 | 41.19 | | | 1 <i>m</i> | β |
| 1898.58 | 298.7 | 41.14 | | 12.7 | 2 <i>m</i> | β |

This is HERSCHEL'S "Garnet star," variable 4 to 6*m* in five or six years; and is No. 253 of SCHJELERUP'S *Catalogue of Red Stars*. The companions were detected with the 18½-inch.

[β (XV)...β...β...β (2457)...β (*Proc. L. C. H.*)...]

β 691. D.M. 07 14529

R.A. 21^h 40^m 4^s *f*
Decl. + 17° 12' *f*

| | | | | | | |
|---------|-------|------|--------|------|------------|---|
| 1877.76 | 328.3 | 1.10 | 0.0... | 11.5 | 1 <i>m</i> | β |
|---------|-------|------|--------|------|------------|---|

Discovered with the 18½-inch. It should be re-measured.

[β (XV)...β...]

β 1036. Varnall 5529

R.A. 21^h 40^m 59^s *f*
Decl. + 17° 51' *f*

| | | | | | | |
|---------|-------|------|-----|------|------------|---|
| 1888.74 | 205.9 | 4.53 | 8.2 | 11 | 3 <i>m</i> | β |
| 1895.79 | 209.2 | 4.70 | 8.0 | 11.7 | 3 <i>m</i> | α |
| 1897.72 | 205.1 | 4.76 | | | 3 <i>m</i> | α |

Discovered with the 12-inch.

[β (XV)...β (2475)...β (*Proc. L. C. H.*)...Athens (*L. L.* 429)
L. A. S. L. VII, 335...]

β 692. Lalande 42651

R.A. 21^h 44^m 49^s *f*
Decl. + 31° 17' *f*

A and B

| | | | | | | |
|---------|------|------|-----|------|------------|----|
| 1878.24 | 10.8 | 2.48 | 7.5 | 11.0 | 2 <i>m</i> | β |
| 1881.72 | 12.7 | 2.70 | 8.0 | 11.0 | 1 <i>m</i> | Hd |
| 1885.66 | 11.0 | 2.76 | | | 1 <i>m</i> | HΣ |
| 1892.79 | 8.8 | 2.97 | 7.0 | 11.0 | 1 <i>m</i> | Hd |

A and C

| | | | | | | |
|---------|-------|-------|--|------|------------|----|
| 1878.78 | 119.4 | 36.89 | | 11.0 | 1 <i>m</i> | β |
| 1892.79 | 298.9 | 37.13 | | 11.0 | 1 <i>m</i> | Ho |

Discovered with the 18½-inch. My record shows that C is on the *f* side.

[β (XV)...β...Hough (2978,3234)...HΣ (...)]

β 840. S.D. (2ⁿ) 5650

R.A. 21^h 46^m 43^s *f*
Decl. + 29° 9' *f*

| | | | | | | |
|---------|------|------|--------|------|------------|-----|
| 1881.83 | 39.4 | 2.57 | 8.7... | 10.0 | 3 <i>m</i> | β |
| 1886.84 | 39.1 | 2.92 | | | 3 <i>m</i> | U1 |
| 1887.84 | 36.9 | 2.94 | 8.8... | 9.8 | 3 <i>m</i> | Com |
| 1899.15 | 36.3 | 2.71 | 9.0... | 10.0 | 4 <i>m</i> | D |

Discovered with the 15½-inch at the Washburn Observatory. The magnitude in S.D. is 9.2.

[β (XV)...β...Updegraff, Lamb and Conners (*Proc. Washburn Obs.* V, VI)...Doolittle (*Pub. Flower Obs.* I)...]

β 168. Lalande 42942

R.A. 21^h 47^m 7^s *f*
Decl. + 29° 35' *f*

| | | | | | | |
|---------|------|------|-----|-----|------------|-----|
| 1868.84 | 73.6 | 6.10 | 7.5 | 8.8 | 1 <i>m</i> | Hd |
| 1876.74 | 75.5 | 5.52 | 8.2 | 7.3 | 2 <i>m</i> | Cin |
| 1877.69 | 73.7 | 5.53 | 8.4 | 7 | 2 <i>m</i> | Cin |
| 1882.48 | 73.7 | 5.93 | 8.2 | 9.5 | 1 <i>m</i> | W |
| 1893.80 | 76.2 | 4.78 | 8 | 9 | 2 <i>m</i> | Sel |
| 1899.50 | 74.0 | 5.59 | | | 2 <i>m</i> | Hd |

Discovered with the 6-inch. Fixed. A distant companion *f*. This pair is also found in the subsequently published Harvard observations.

[β (XV)...β (1446)...XXIV, 321...*Harvard Flower Obs.* XII...Cin...Cin...Wilson (Cin¹⁰)...Sellors (3240)...Houssier (1...)]

β 169. O. Arg. S. 21740R.A. 21^h 56^m 19^s 7
Decl. - 21° 43'

| | | | | | | |
|---------|-------|------|--------|-----|----------------|-----|
| 1876.78 | 285.7 | 1.93 | 9.0... | 9.0 | 1 ⁿ | Cin |
| 1877.68 | 275.9 | 2.01 | 8.6... | 8.7 | 1 ⁿ | Cin |
| 1892.70 | 282.6 | 2.10 | 9.0... | 9.2 | 2 ⁿ | W |
| 1893.81 | 279.6 | 2.26 | 9... | 9 | 1 ⁿ | Sel |
| 1898.91 | 279.7 | 1.92 | 9.2... | 9.2 | 3 ⁿ | D |

Discovered with the 6-inch. The south star of a wide pair about 95' apart.

[β (III)...β (Mon. Not. xxxiv, 59)...Cin³...Cin⁴... Sellors (3240)...Wilson ()...Doolittle (Pub. Flower Obsy. 1)...]

β 1214. D.M. 133 + 138°R.A. 21^h 51^m 23^s 7
Decl. - 33° 45'

A and B

| | | | | | | |
|---------|-------|------|--------|------|----------------|-----|
| 1890.65 | 205.0 | 1.39 | 9.0... | 10.3 | 3 ⁿ | β |
| 1898.72 | 201.1 | 1.05 | 9.2... | 10.5 | 2 ⁿ | A |
| 1898.79 | 202.4 | 1.25 | 8.4... | 10.2 | 2 ⁿ | β |
| 1898.89 | 207.4 | 1.55 | ... | ... | 1 ⁿ | Bar |

C and D

| | | | | | | |
|---------|-------|------|---------|------|----------------|-----|
| 1890.65 | 245.8 | 5.06 | 9.8... | 10.8 | 3 ⁿ | β |
| 1898.72 | 243.2 | 4.88 | 10.0... | 10.8 | 2 ⁿ | A |
| 1898.79 | 246.7 | 4.93 | 8.5... | 11.2 | 2 ⁿ | β |
| 1898.89 | 245.1 | 5.04 | ... | ... | 1 ⁿ | Bar |

A and C

| | | | | | | |
|---------|------|--------|-----|-----|----------------|-----|
| 1890.65 | 18.3 | 112.13 | ... | ... | 3 ⁿ | β |
| 1898.71 | 18.9 | 112.47 | ... | ... | 1 ⁿ | A |
| 1898.79 | 18.1 | 112.32 | ... | ... | 2 ⁿ | β |
| 1898.89 | 18.1 | 112.04 | ... | ... | 1 ⁿ | Bar |

This quadruple was discovered with the 18½-inch in 1884, but not included in the Chicago catalogues. The 36-inch shows a faint star about 20' from C in the direction of 285°, and also a 5' pair of faint stars between AB and CD, with many small stars in the field. C is D.M. (33°) 4388.

[β (XIV) 3 (3047) 31 (Pub. F. O. II) ...Aitken (1884) ...]

β 275. *Unrecorded in 370.1*R.A. 21^h 54^m 58^s 7
Decl. + 60° 45'

| | | | | | | |
|---------|-------|------|--------|-----|----------------|----|
| 1876.04 | 2.7 | 0.28 | 7.0... | 7.6 | 2 ⁿ | J |
| 1885.54 | 1.1 | 0.43 | ... | ... | 2 ⁿ | H2 |
| 1889.70 | 5.5 | 0.27 | ... | ... | 2 ⁿ | Sp |
| 1890.68 | 3.8 | 0.39 | 7.6... | 7.8 | 3 ⁿ | β |
| 1898.67 | 182.4 | 0.52 | 7.5... | 7.6 | 3 ⁿ | A |

Discovered with the 9.4-inch at the Dartmouth College Observatory. A difficult pair with small apertures. The measures do not show the change which would be expected in a pair of this class.

[β (X) 3 (Mon. Not. xxxiv, 59)...β (13285) 3 (Pub. F. O. II) ...d (I) ...Sp (III) ...Aitken (3585) ...H2 () ...]

β 276. η *Piscis Australis*R.A. 21^h 52^m 29^s 7
Decl. - 29° 2'

| | | | | | | |
|---------|-------|------|--------|-----|----------------|-----|
| 1876.78 | 117.4 | 1.87 | 5.0... | 6.0 | 4 ⁿ | Cin |
| 1877.51 | 115.4 | 1.73 | 5.5... | 6.3 | 1 ⁿ | Cin |
| 1879.66 | 111.2 | 1.69 | 6.0... | 7.2 | 1 ⁿ | Cin |
| 1880.56 | 113.7 | 1.73 | 5.5... | 7.2 | 1 ⁿ | Cin |
| 1884.70 | 116.2 | 1.64 | 5.2... | 6.8 | 3 ⁿ | W |
| 1885.86 | 118.1 | 1.81 | ... | ... | 2 ⁿ | HI |
| 1886.78 | 115.9 | ... | ... | ... | 1 ⁿ | LM |
| 1887.79 | 115.7 | 1.81 | ... | ... | 2 ⁿ | HI |
| 1888.78 | 118.5 | 1.64 | 5.5... | 5.9 | 3 ⁿ | β |
| 1888.89 | 113.3 | 1.50 | 5.0... | 6.7 | 2 ⁿ | W |
| 1892.67 | 112.4 | 1.66 | 6.4... | 6.8 | 2 ⁿ | G |
| 1893.78 | 115.0 | 1.80 | ... | ... | 2 ⁿ | Sp |
| 1894.75 | 111.3 | 1.70 | ... | ... | 3 ⁿ | Sp |
| 1895.77 | 112.1 | 1.68 | ... | ... | 3 ⁿ | Sp |
| 1897.02 | 117.3 | 1.84 | ... | ... | 3 ⁿ | Sp |
| 1898.14 | 115.8 | 1.75 | 6... | 7 | 3 ⁿ | Sp |

Discovered with the 6-inch. A fine easy pair, and visible with a much smaller aperture. Probably unchanged. The magnitude in Cord. G. C. is 5.7. The *Cape Catalogue* gives a proper motion of 0.026 in the direction of 270°. It is very probable that this motion belongs to both stars.

[β (X) 3 (Mon. Not. xxxiv, 59)...β (13285) 3 (Pub. F. O. II) ...Cin¹...Cin⁴...Cin⁵...Wilson (Cin⁶)... Hall (II)...LM...Lvt...Scott (Brit. Ast. Ass. v, 75; O. 25 (1881) ...C. (C. 4) ...Aitken (1884) ...]

3004. *Asplenium* ;

| Time (hr) | Temp. (°C) | Pressure (mm) | Flow (ml) | Yield (%) | Product |
|-----------|------------|---------------|-----------|-----------|---------|
| 1.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 2.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 3.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 4.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 5.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 6.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 7.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 8.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 9.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 10.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 11.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 12.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 13.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 14.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 15.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 16.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 17.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 18.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 19.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 20.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 21.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 22.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 23.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 24.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 25.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 26.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 27.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 28.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 29.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 30.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 31.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 32.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 33.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 34.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 35.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 36.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 37.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 38.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 39.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 40.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 41.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 42.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 43.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 44.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 45.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 46.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 47.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 48.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 49.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 50.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 51.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 52.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 53.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 54.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 55.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 56.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 57.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 58.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 59.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 60.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 61.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 62.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 63.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 64.0 | 100 | 1.0 | 1.0 | 100 | 100 |
| 65.0 | 100 | 1.0 | 1.0 | 100 | 100 |

Dimensions, with the 100 and 250. The sternobasals, 2.4 mm, 5.4 mm, 9.0 mm, 24.1%, and a 13.5 mm, 27.7–34.7% (0.8–1.5 mm). In BAC 6 mm. Age under 6.5 m.

$$U(t) = \mathbb{R}^n, \quad U(t)(v) = \frac{1}{2} \frac{d}{dt} \langle v, v \rangle, \quad U(t) = 0, \quad (112)$$

β 695. H. M. ...

Decl. — 100 — 41 — 5

| | | | | | |
|---------|-------|------|------------|----|---------|
| 1885.54 | 144.8 | 2.93 | 8.0...12.3 | 20 | β |
| 1885.54 | 144.8 | 2.93 | | 26 | 112 |
| 1885.54 | 144.8 | 2.91 | 8.3...10.5 | 30 | β |
| 1885.54 | 144.8 | 3.11 | 7.0...11.0 | 30 | A |

Discovered with the 18½-inch. No sensible change.

B 696. 1971. 118 p. 158.

K.A. 21^b 58 11 0
 10 0 0 17 0

| \bar{y} | s^2 | σ^2 | μ | σ | β |
|-----------|-------|-------------|-------|----------|---------|
| 355.4 | 0.50 | 8.0 ... 8.0 | 20 | J | |
| 353.8 | 0.65 | 8.5 ... 9.0 | 20 | B | |
| 354.0 | — | — | 10 | B | |
| 3589.85 | 361.9 | — | 20 | NP | |
| — | 0.52 | 8.5 ... 9.0 | 20 | W | |
| 1594.57 | 0.5 — | — | 20 | NP | |
| — | 0.50 | 8.1 ... 8.5 | 20 | V | |

Discovered with the 18½-inch. Apparently fixed relatively. The γ star of a small triangle. The *Berlin A. G. Catalogue* gives this star a proper motion of 0.092 in the direction of 206°0. Obviously the movement of both stars is the same.

β 474. O. Arg. N. 23373

| | | | | |
|--------|----|----|----|----------|
| Re A. | 22 | 1 | 2 | θ |
| Length | 60 | 60 | 28 | A |

| | | | | | |
|---------|-------|-------|----------------|-----|---------|
| 1878.67 | 345.0 | 16.28 | 8.5 . . . 12.0 | 1st | β |
| 1891.71 | 346.6 | 16.42 | 8.1 . . . 11.8 | 3rd | β |

Discovered with the 6-inch.

β (IX) = β (Mon. Ann. XXXIII, 78) = β (3114) = β (Pub. L. O. II), ...]

β 697. 14) *Cephel*

| | | | | |
|-------|----|----|----|---|
| R.A. | 22 | 0 | 27 | h |
| Decl. | 0 | 01 | 42 | N |

| | | | | | |
|---------|------|-------|----------------|------------|---------|
| 1878.60 | 95.5 | 19.75 | 0.0 . . . 12.0 | 1 <i>n</i> | β |
| 1891.71 | 94.4 | 19.80 | 5.7 . . . 11.5 | 3 <i>n</i> | β |
| 1898.58 | 93.1 | 20.18 | . . . 12.1 | 2 <i>n</i> | β |

Discovered with the 18½-inch. This star has a proper motion of 0".081 in the direction of 114°.0 (AUWERS). It is probable that the small star does not share in this movement.

$$[\beta(N)] = \beta, \quad \beta(3114), \quad \beta(Pub, I(0,11), \dots)$$

β 990. D.M. (62°) 2030

R.A. 22^h 1^m 32^s
Decl. +62° 30' 00"

| | | | | | |
|---------|-------|------|--------------|----|---------|
| 1886.61 | 122.3 | 0.65 | 8.3 ... 9.7 | 3n | β |
| 1891.72 | 124.9 | 0.50 | 8.5 ... 9.8 | 3n | β |
| 1898.49 | 121.7 | 0.51 | 8.9 ... 10.2 | 2n | 1 |

Discovered with the 18½-inch in the course of an examination of Σ 2879 and the vicinity for the purpose of seeing whether there was any other pair to which certain discordant measures, credited to Σ 2879 might belong. These measures are as follows:

| | | | | |
|---------|-------|------|----|--------|
| 1840.61 | 129.7 | 0.91 | 17 | OΣ |
| 1856.93 | 130.5 | 0.5 | 17 | Secchi |

There has been no material change in either angle or distance of Σ 2879 since the first measures, as will be seen from the following :

| | | | | |
|---------|-------|------|----|----------|
| 1836.35 | 226.2 | 0.80 | 3" | Σ |
| 1879.94 | 220.6 | 0.87 | 3" | β |

It is certain that the measures of $\text{O}\Sigma$ and Secchi cannot belong to this star, unless by a curious coincidence each made the same error of about 100° in reading the position-angle. Apparently neither observer noted the discrepancy, or it would have been followed by further observations. It will be seen that the measures fairly well describe β 990, and there is at least a probability that they belong to that pair. It is a much more difficult double than Σ 2879. The magnitude of β 990 in the D.M. is 9.0. It is $5^m 46^s$ and $18' s$ of Σ 2879.

[β (XII)... β^2 ... β (3114)... β (*Pub. L. O. II*)... Double (*Pub. Flower Obs.* 1)...]

β 170. Lalande 13148

R.A. $22^h 2^m 31^s$
Decl. $19^\circ 4' N$

| | | | | | |
|---------|------|------|--------|----|-----|
| 1876.05 | 63.7 | 1.09 | 9.1... | 14 | J |
| 1877.50 | 60.5 | 1.68 | 8.1... | 5 | Cin |
| 1885.73 | 94.5 | 1.39 | 8.0... | 2 | W |
| 1886.67 | 59.6 | 1.75 | 7.8... | 6 | I.M |
| 1888.73 | 62.5 | 1.71 | 9.0... | 2 | T |
| 1888.78 | 60.4 | 1.56 | 8.2... | 2 | Lv |
| 1893.82 | 58.2 | 1.17 | 8.2... | 2 | Sel |
| 1896.72 | 59.0 | 1.42 | ... | 2 | Hu |
| 1897.78 | 58.6 | 1.74 | 8.2... | 3 | See |

Discovered with the 6-inch. This star is a distant companion ($40^\circ : 160^\circ$) to 35 *Aquarii*. There is a faint star between. The wide pair in the field *nf* is H 3092.

[β (III)... β (*Mon. Not. XXXIV*, 59)... β (I)...Cin³...Cin⁴...Cin⁵...Wilson (Cin⁹)...L.M...Lv¹...Tarrant (2991)...Sellers (3240)...Hussey (*A.J.* 397)...See (3496)...]

β 842. D.M. (1) 1811

R.A. $22^h 3^m 41^s$
Decl. $19^\circ 5' N$

| | | | | | |
|---------|-------|------|--------|-----|---------------------|
| 1881.73 | 121.1 | 1.20 | 8.8... | 0.1 | β |
| 1886.84 | 118.7 | 1.28 | ... | | UI |
| 1887.77 | 121.6 | 1.23 | 8.8... | 0.7 | 3 rd Com |

Discovered with the $15\frac{1}{2}$ -inch at the Washburn Observatory.

[β (XI)... β^2 ...U polegnaff, Lalande and Comstock (*Pub. Washburn Obs.* V, vi)...]

β 375. O. Ariz. No. 2454

R.A. $22^h 4^m 29^s$
Decl. $19^\circ 5' N$

| | | | | | |
|---------|-------|------|--------|------|-------------------------|
| 1876.41 | 304.7 | 0.93 | 8.5... | 10.5 | 1 st J |
| 1891.72 | 306.9 | 0.88 | 8.5... | 9.2 | 2 nd β |

Discovered with the 6-inch.

[β (vi)... β (2062, 3114)... β (*Pub. L. O. II*)... β (I)...]

β 769. Lalande 13949

R.A. $22^h 4^m 37^s$
Decl. $19^\circ 4' N$

| | | | | | |
|---------|-------|-----------|--------|-----|-------------------------|
| 1879.69 | 348.6 | 0.6 \pm | 7.0... | 8.0 | 1 st β |
| 1891.85 | 351.6 | 0.91 | 7.4... | 8.1 | 3 rd β |
| 1897.79 | 342.4 | 0.46 | 6.1... | 8.1 | 1 st See |
| 1898.76 | 357.4 | 0.66 | 7.0... | 7.9 | 4 th A |

Discovered with the 6-inch at Mt. Hamilton in 1879. Probably direct motion in angle. GOULD 6.8 m.

[β (xi)... β^2 ... β (3114)... β (*Pub. L. O. II*)...See (3496). Aitken (3585)...]

β 698. Lalande 43303

R.A. $22^h 5^m 55^s$
Decl. $19^\circ 48' N$

| | | | | | |
|---------|-------|-------|--------|------|-------------------------|
| 1878.74 | 337.0 | 0.97 | 7.2... | 12.0 | 2 nd β |
| 1885.73 | 337.5 | 1.045 | ... | | 11 Σ |
| 1891.63 | 337.0 | 1.55 | 6.8... | 11.8 | 2 nd β |
| 1898.88 | 337.8 | 10.33 | 8.0... | 10.8 | 2 nd β |

Discovered with the 18 $\frac{1}{2}$ -inch. Fixed.

[β (x)... β^2 ... β (3114)... β (*Pub. L. O. II*)...11 Σ ()...]

β 475. Lalande 43305

R.A. $22^h 6^m 18^s$
Decl. $19^\circ 30' N$

| | | | | | |
|---------|-------|------|--------|------|-------------------------|
| 1879.72 | 249.0 | 1.8 | 7.5... | 11.0 | 2 nd β |
| 1879.75 | 239.0 | | 7.0... | 11.0 | 2 nd β |
| 1882.02 | 247.3 | 1.83 | 7.5... | 9.2 | 2 nd W |
| 1886.76 | 240.5 | 1.02 | 7.0... | 11.2 | 2 nd I.M |
| 1891.84 | 228.3 | 1.81 | 7.0... | 10.4 | 2 nd β |
| 1897.86 | 229.0 | 1.40 | ... | | 2 nd H |

Discovered with the 6-inch. The measures are not very accordant in angle, and change is doubtful.

α 111...Cin⁶...Wilson (Cin⁶)...LM...Hussey (*A. J.*
1891).

β 430. α 111...N. 228.2

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

A and B

| | | | | | | |
|---------|-------|-------|-----|------|----|---------|
| 1880.96 | 327.8 | 19.31 | ... | 12.5 | 19 | J |
| 1880.96 | 327.8 | 19.31 | ... | 12.5 | 19 | Ho |
| 1880.96 | 327.8 | 19.31 | ... | 12.5 | 29 | β |

A and C

| | | | | | | |
|---------|-------|-------|-----|----|----|---------|
| 1880.96 | 327.8 | 19.31 | ... | 13 | 19 | Ho |
| 1880.96 | 327.8 | 19.31 | ... | 29 | 19 | β |

The small star, B, was noted with the 6 inch, and the third star, C, added by Hough with the 18½-inch. In 1889 he measured the principal star as a close pair, 208.5 : 0.53, on a single night, the new component being 11 m. I could see no trace of any elongation with the 36-inch in 1890, nor at any subsequent time.

[1890.96... β 430... α 111...Hough (12978)...]

β 1215. α 111...15711

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|-------|-------|-----|----|----|---------|
| 1880.96 | 327.8 | 19.31 | ... | 13 | 19 | β |
| 1880.96 | 327.8 | 19.31 | ... | 13 | 19 | A |

Discovered with the 12-inch.

[1890.96... β 1215... α 111...Hough (12978)...]

β 609. α 111...15711

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|-------|------|--------|------|----|---------|
| 1878.44 | 185.1 | 11.1 | ... | 12.2 | 39 | β |
| 1891.72 | 185.1 | 11.1 | ... | 12.2 | 39 | β |
| 1896.80 | 186.3 | 11.1 | ... | 12.2 | 19 | L |
| 1899.54 | 184.5 | 2.46 | 7.9... | 12.3 | 39 | A |
| 1899.54 | 184.2 | 2.11 | 8.5... | 12.0 | 19 | D |

Discovered with the 18½-inch.

[1890.96... β 609... α 111...Hough (12978)...]
[1890.96... β 609... α 111...Hough (12978)...]
[1890.96... β 609... α 111...Hough (12978)...]

β 171. Lalande 43350

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|-------|-------|--------|------|----|-----|
| 1878.75 | 258.9 | 11.45 | 8.3... | 12.0 | 39 | Cin |
| 1892.70 | 259.8 | 11.66 | 8.8... | 12.2 | 29 | W |
| 1898.50 | 256.0 | 11.52 | 8.5... | 10.2 | 29 | D |
| 1898.95 | 258.1 | 11.49 | 8.0 | 11.2 | 39 | Cg |

Discovered with the 6-inch. This is a distant companion to α 111 *Aquarii*.

[β (iii)... β (Mon. Not. xxxiv, 59)...Cin⁶...Cin⁶...Cin⁶...Wilson (Cin⁶)...Corshall (Cin⁶)...Doolittle (*Pub. Flowers*...)]

β 376. Radcliffe 5607

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|-------|------|--------|------|----|----|
| 1870.24 | 149.2 | 3.57 | 8.0... | 11.2 | 29 | J |
| 1885.54 | 148.2 | 3.61 | ... | ... | 29 | HS |
| 1892.75 | 150.7 | 3.68 | 7.7... | 10.8 | 39 | W |

Discovered with the 6-inch. Σ 2880 is 22' n.

[β 376... β 12062... β 171... α 111...J (ii)...Wilson (Cin⁶)...HS...]

β 476. W. XXII. 180

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|------|------|--------|------|----|------|
| 1877.57 | 93.4 | 2.57 | 9.5... | 10.4 | 39 | J |
| 1882.68 | 90.5 | 2.27 | 9.5... | 10 | 19 | Proy |
| 1893.54 | 92.5 | 2.57 | 9.1... | 10.0 | 39 | LV |
| 1894.63 | 93.4 | 2.52 | 9.2... | 10.0 | 29 | W |

Discovered with the 6 inch. β 477 is in a low power field.

[β (ix)... β 476... α 111...XXXIII, 78)... α 111...Petty (*Ang.*...)
[β 476...XXXIII, 68)...LV (*A. J.* 382)...Wilson (Cin⁶)...]

β 991. Radcliffe 5619

R.A. 22^h 51^m 11^s
Decl. + 30° 48' 11"

| | | | | | | |
|---------|-------|--------|--------|-----|----|---------|
| 1880.19 | 150.9 | 0.59 | 8.0... | 8.0 | 59 | β |
| 1893.55 | 143.4 | 0.57 | 8.0... | 8.2 | 29 | LV |
| 1893.66 | 148.2 | 0.73 | 8.8... | 8.8 | 29 | W |
| 1893.82 | | Single | | | | Com |
| 1896.66 | | Single | | | | Com |
| 1896.89 | 145.0 | 0.59 | | | 39 | A |

Discovered with the 18½-inch. There does not appear to be any material change.

[β (xiii)... β ...Lv (*A. J.* 382)...Wilson ()...Comstock (*Pub. Warner Obs.* 8)...Aitken (3466)...]

β 477. W XXV. 225

R.A. 22 11 28.9
Dec. - 54 43.3

| | | | | | | |
|---------|------|------|--------|------|----|---------|
| 1877.45 | 45.7 | 9.51 | 9.3... | 11.2 | 39 | β |
| 1882.68 | 46.0 | 7.04 | 9... | 11.1 | 19 | Perry |
| 1893.54 | 43.5 | 6.48 | 9.0... | 9.8 | 39 | Lv |
| 1894.63 | 43.4 | 6.48 | 9.2... | 11.5 | 29 | W |
| 1899.12 | 43.6 | 6.64 | 9.2... | 9.7 | 49 | D |

Discovered with the 6-inch.

[β (ix)... β (*Mon. Not.* xxxviii, 78)...*A. J.* 382)...Perry (*Mon. Not.* xxxvi, 65)...Lv (*A. J.* 382)...Wilson ()...Doolittle (*Pub. Flower Obs.* 1)...]

β 377. O. Ar. N. 23793

R.A. 22 11 23.9
Dec. - 54 44.3

Band C

| | | | | | | |
|---------|-------|------|---------|------|----|---------|
| 1891.54 | 302.8 | 7.02 | 10.6... | 11.5 | 39 | β |
| 1898.58 | 303.6 | 6.80 | 9.7... | 11.1 | 29 | β |

A and B

| | | | | | |
|---------|------|-------|--------|----|---------|
| 1891.54 | 65.9 | 63.88 | 8.0... | 39 | β |
| 1898.58 | 65.8 | 62.30 | 7.2... | 29 | β |

Distant double companion noted with the 6-inch. The large star has a proper motion of 0.226 in the direction of 81°4 (*A. G. C.*). The measures of AB give for this movement 0.225 in 62°. The 36-inch shows six or eight stars nearer to A than B, including a faint pair, with distance less than BC, 16½ from A in the direction of 263°.

[β (vi)... β (2062, 3114)... β (*Pub. L. O. II.*)...]

β 378. O. Ar. N. 23792

R.A. 22 11 23.9
Dec. - 54 43.3

A and B

| | | | | | | |
|---------|------|------|--------|------|----|---------|
| 1876.55 | 90.8 | 3.18 | 9.2... | 10.2 | 29 | J |
| 1878.65 | 90.4 | 3.33 | 8.7... | 8.3 | 19 | β |
| 1892.75 | 90.9 | 3.39 | 8.5... | 9.3 | 39 | W |
| 1898.70 | 88.3 | 3.44 | 8.7... | 9.5 | 29 | D |

Band C

| | | | | | | |
|---------|------|------|-----|------|----|---------|
| 1878.65 | 29.4 | 7.48 | ... | 11.8 | 19 | β |
| 1892.74 | 31.6 | 7.06 | ... | 12.5 | 29 | W |
| 1898.70 | 29.0 | 7.42 | ... | 11.3 | 29 | D |

B was discovered with the 6-inch, and C added with the 18½-inch.

[β (ii)... β (2062)... β ... β (i)...Wilson ()...Doolittle (*Pub. Flower Obs.* 1)...]

β 1216. Lalande 13023

R.A. 22 14 42.9
Dec. - 28 33.3

| | | | | | | |
|---------|-------|------|--------|-----|----|---------|
| 1890.51 | 317.7 | 0.64 | 8.4... | 8.7 | 39 | β |
| 1892.76 | 317.9 | 0.52 | ... | ... | 69 | Sp |
| 1895.74 | 312.5 | 0.52 | ... | ... | 39 | Lew |
| 1896.73 | 314.5 | 0.46 | ... | ... | 29 | Lew |
| 1896.90 | 315.7 | 0.57 | ... | ... | 49 | A |
| 1897.69 | 310.9 | 0.54 | ... | ... | 29 | Bow |
| 1897.76 | 311.4 | 0.55 | ... | ... | 19 | Lew |
| 1898.67 | 314.2 | 0.54 | ... | ... | 39 | Lew |

Discovered with the 16-inch of the Warner Observatory in 1885.

[β (xvii)... β (3047)... β (*Pub. L. O. II.*)...Sp (iii)...Lewys and Bowyer (*Mon. Not.* 1892, 1893, 1894)...(*Harvard Obs.* 1895)...Aitken (3466)...]

β 1217. Lalande 13035

R.A. 22 15 43.9
Dec. - 30 32.3

| | | | | | | |
|---------|-------|------|--------|------|----|---------|
| 1892.53 | 218.9 | 0.61 | 7.4... | 10.3 | 39 | β |
| 1892.53 | 225.0 | 0.52 | ... | ... | 39 | Sp |
| 1896.78 | 224.8 | 0.59 | ... | ... | 29 | A |

Discovered with the 36-inch. A difficult pair, and therefore the change in angle requires verification. The magnitude in D.M. is 7.0.

[β (xviii)... β (3047)... β (*Pub. L. O. II.*)...Sp (iii)...Aitken (3466)...]

β 379. R. Ar. N. 23793

R.A. 22 11 23.9
Dec. - 54 43.3

| | | | | | | |
|---------|-------|------|--------|-----|----|---------|
| 1877.26 | 332.0 | 4.11 | 8.3... | 8.5 | 39 | β |
| 1882.78 | 339.0 | 1.08 | 8.5... | 8.5 | 39 | W |
| 1891.05 | 333.7 | 1.02 | 8.4... | 8.5 | 39 | β |

β 291. W⁺ XXII. 436

R.A. 22^h 21^m 39^s $\frac{1}{2}$
Decl. + 3 55 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|----------------|----------------|---------|
| 1875.82 | 157.8 | 0.33 | 8.4... | 8.4 | 4 ⁿ | J |
| 1878.64 | 160.0 | 0.42 | 8.5... | 8.8 | 1 ⁿ | β |
| 1880.08 | 165.5 | 0.50 | 8.2... | 8.5 | 2 ⁿ | β |
| 1886.77 | 162.9 | 0.38 | 8.0... | 8.3 | 1 ⁿ | LM |
| 1889.63 | 167.5 | 0.46 | 8.4... | 8.7 | 3 ⁿ | β |
| 1890.58 | 164.8 | 0.40 | ... | 7 ⁿ | Sp | |
| 1893.75 | 173.8 | 0.47 | 8.0... | 8.2 | 2 ⁿ | W |
| 1894.74 | 168.4 | 0.30 | ... | 6 ⁿ | Sp | |
| 1898.75 | 173.5 | 0.52 | 8.0... | 8.0 | 3 ⁿ | A |
| 1898.77 | 173.2 | 0.52 | ... | 2 ⁿ | Bry | |

This star was suspected with the 6-inch to be a close pair in 1872, and verified by me with the 26-inch at Washington in August 1874. It is a difficult object with a small aperture. It is clearly a binary. Both angle and distance are increasing, and it is much easier now than it was at the time of discovery. AITKEN measures a 13.5 m star, 125° 0': 31'.06 (1898.78) 1ⁿ. This pair is within the triangle of 6 m stars formed by 34, 35, and 37 *Pegasi*. The first of these bright stars is β 290, and the last Σ 2912.

[β (v)... β (*Mon. Not.* XXXV, 31)... β ... β (2057)... β (*Pub. L. O.* II)... β (i)...LM...Sp (iii)...Wilson ()...Aitken (3585)...Bryant ()...]

 β 380. Radcliffe 5693

R.A. 22^h 22^m 27^s $\frac{1}{2}$
Decl. + 49 0 $\frac{1}{2}$

C and D

| | | | | | | |
|---------|-------|-------|--------|------|----------------|---------|
| 1877.60 | 245.7 | 21.4 | 7.7... | 12.5 | 1 ⁿ | β |
| 1893.73 | 243.1 | 21.34 | 7.8... | 12.8 | 3 ⁿ | W |

A and B

| | | | | | | |
|---------|-------|-------|--------|------|----------------|---|
| 1876.10 | 321.6 | 24.37 | ... | 12.0 | 2 ⁿ | J |
| 1893.67 | 322.5 | 24.93 | 7.8... | 10.3 | 3 ⁿ | W |

A and C (Σ App. 234)

| | | | | | | |
|---------|-------|-------|--------|-----|----------------|----|
| 1874.97 | 134.2 | 36.31 | 7.3... | 7.7 | 3 ⁿ | J |
| 1886.52 | 134.2 | 36.36 | 8.0... | 8.3 | 1 ⁿ | F1 |
| 1893.67 | 134.2 | 36.15 | ... | 8.3 | 3 ⁿ | W |

Discovered with the 6-inch. All the measures of the O Σ stars are given.

[β (vi)... β (2062)... β (i)...Franz (3080)...Wilson ()...]

 β 701. Lalande 43607

R.A. 22^h 22^m 16^s $\frac{1}{2}$
Decl. + 11 38 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|------|----------------|------------|
| 1877.82 | 283.4 | 1.24 | 7.0... | 10.6 | 2 ⁿ | J |
| 1878.24 | 279.9 | 1.24 | 7.5... | 10.2 | 2 ⁿ | β |
| 1887.59 | 273.9 | 1.31 | ... | ... | 5 ⁿ | H Σ |
| 1893.69 | 277.2 | 1.18 | 7.3... | 10.7 | 3 ⁿ | W |
| 1897.89 | 268.0 | 1.42 | ... | ... | 1 ⁿ | Br |

Discovered with the 18½-inch. PORTER gives the principal star a proper motion of 0".166 in the direction of 79° 6. The companion is evidently moving with it.

[β (X)... β ... β (i)...Wilson ()...H Σ ()...Brown ()...]

 β 173. D.M. (56°) 2776

R.A. 22^h 22^m 24^s $\frac{1}{2}$
Decl. + 59 35 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|------|----------------|---|
| 1875.83 | 232.8 | 2.88 | 8.4... | 10.7 | 5 ⁿ | J |
| 1892.75 | 232.1 | 2.90 | 8.2... | 10.5 | 3 ⁿ | W |

Discovered with the 6-inch.

[β (III)... β (*Mon. Not.* XXXV, 50)... β (i)...Wilson ()...]

 β 1218. W⁺ XXII. 176

R.A. 22^h 22^m 33^s $\frac{1}{2}$
Decl. + 29 57 $\frac{1}{2}$

| | | | | | | |
|---------|------|------|-----|-----|----------------|---------|
| 1890.52 | 53.5 | 1.44 | 8.6 | 8.8 | 3 ⁿ | β |
| 1890.95 | 51.0 | 1.15 | 8.7 | 9.0 | 2 ⁿ | Ho |
| 1892.16 | 55.0 | 1.42 | ... | ... | 4 ⁿ | Sp |
| 1892.93 | 57.2 | 1.10 | 8.0 | 8.5 | 2 ⁿ | J |
| 1893.94 | 54.5 | 1.42 | ... | ... | 3 ⁿ | Sp |
| 1895.77 | 52.8 | 1.76 | ... | ... | 2 ⁿ | Lew |
| 1896.73 | 52.1 | 1.72 | ... | ... | 1 ⁿ | Lew |
| 1896.77 | 52.7 | 1.33 | ... | ... | 3 ⁿ | A |
| 1896.86 | 55.2 | 1.46 | ... | ... | 2 ⁿ | Bow |
| 1897.67 | 55.2 | 1.53 | ... | ... | 1 ⁿ | Bow |
| 1897.76 | 54.6 | 1.61 | ... | ... | 1 ⁿ | Lew |
| 1898.67 | 50.8 | 1.59 | ... | ... | 3 ⁿ | Lew |
| 1898.68 | 52.2 | 1.48 | ... | ... | 2 ⁿ | Bow |

Discovered with the 12-inch. Evidently unchanged.

[β (XIII)... β (1897)... β (*Pub. L. O.* III)...Hewell (1824)...Sp (III)...Jones (*Proc. Astron. Soc.* 1862)...Lewis (*Mem. Am. A.S.* 181, 1841 1842)...B. B. 1946...1883...Aitken (3466)...Lewis and Bowyer ()...]

β 174. *Gliese 174*

R.A. 22^h 23^m 30^s
Decl. - 57° 17' 3"

| | | | | | |
|---------|-------|-------|-----|------|---------------------|
| 1878.43 | 247.3 | 7.20 | 8.5 | 12.0 | 3 ^m J |
| 1878.77 | 200.0 | 10.00 | 8.5 | 12.0 | 2 ^m C 45 |
| 1880.83 | 202.0 | 10.00 | 8.5 | 12.3 | 3 ^m B |
| 1888.13 | 203.7 | 8.62 | 8.5 | 10.7 | 3 ^m B |
| 1892.12 | 199.3 | 9.06 | 8.0 | 10.5 | 2 ^m B |

Discovered with the 6-inch. Probably not changed.

[β (11)... β (*Mon. Not.* XXXIII, 351)...*Annals Harvard Obs.*, 510)... β (1)...C 45...*Lalande* 4386...*Boothroyd* 13181...]

 β 478. *Gliese 478*

R.A. 22^h 23^m 30^s
Decl. - 57° 17' 3"

A and B

| | | | | | |
|---------|------|------|-----|------|-------------------|
| 1878.20 | 30.3 | 4.32 | 8.5 | 11.2 | 2 ^m B |
| 1886.80 | 32.2 | 4.38 | 9.6 | 11.2 | 1 ^m LM |
| 1898.72 | 30.6 | 1.62 | 8.5 | 10.2 | 2 ^m Bd |
| 1898.75 | 30.4 | 1.23 | 9.2 | 10.3 | 3 ^m A |
| 1898.74 | 30.4 | 1.24 | 8.6 | 10.3 | 1 ^m B |

A and C

| | | | | | |
|---------|-------|-------|----------------|----------------|------------------|
| 1878.20 | 239.0 | 10.15 | 9.0 | 10.0 | 3 ^m B |
| 1888.13 | 200.0 | 28.69 | 8.7 | 3 ^m | C ₂ |
| 1898.74 | 200.2 | 29.08 | 2 ^m | | A |
| 1898.84 | 199.7 | 28.67 | 8.7 | 10.0 | B |

Discovered with the 6-inch. The middle of three stars in the field. Unchanged. Boothroyd (*Annals Harvard Obs.*, 510)...*Mon. Not.* XXXIII, 351...*Boothroyd* 13181...]

[β (11)... β (*Mon. Not.* XXXVIII, 78)... β ...LM...Boothroyd 13181...]

 β 79. *Gliese 79*

R.A. 22^h 23^m 30^s
Decl. - 57° 17' 3"

| | | | | | |
|---------|-------|------|-----|------|--------------------|
| 1867.50 | 332.1 | 1.50 | 8.0 | 10.0 | 2 ^m Hd |
| 1876.24 | 113.1 | 1.47 | 8.0 | 10.1 | 3 ^m J |
| 1879.15 | 333.6 | 1.31 | 8.3 | 9.8 | 3 ^m Cin |
| 1888.85 | 113.3 | 1.24 | 8.0 | 9.7 | 1 ^m J 3 |
| 1895.77 | 113.1 | 1.21 | 8.0 | 10.0 | 1 ^m T |
| 1898.80 | 333.6 | 1.24 | 8.0 | 10.0 | 1 ^m T |
| 1898.65 | 113.1 | 1.22 | 8.0 | 10.0 | 1 ^m Bd |

Discovered with the 6-inch. In a low-power field with ξ Aquarii. No relative motion. An earlier observation is found in *Harvard Annals*, published after β (1).

[β (11)... β (*Mon. Not.* XXXIII, 351)...*Annals Harvard Obs.*, 510)... β (1)...C 45...*Lalande* 4386...*Boothroyd* 13181...]

 β 844. *Lalande 43912*

R.A. 22^h 23^m 30^s
Decl. - 57° 17' 3"

B and C

| | | | | | |
|---------|-------|------|-----|------|---------------------|
| 1881.73 | 317.1 | 3.20 | 9.3 | 10.9 | 3 ^m B |
| 1886.84 | 317.7 | 3.25 | 9.3 | 10.9 | 4 ^m U 1. |
| 1887.79 | 316.5 | 3.44 | 9.6 | 10.7 | 2 ^m Com |
| 1888.88 | 310.7 | 3.30 | 8.8 | 11.2 | 3 ^m L v |
| 1891.86 | 316.1 | 3.30 | 9.7 | 10.8 | 1 ^m B |

A and B

| | | | | |
|---------|------|-------|-----|---------------------|
| 1881.73 | 34.3 | 98.84 | 8.1 | 3 ^m B |
| 1889.84 | 34.2 | 98.81 | 8.1 | 4 ^m U 1. |
| 1891.86 | 34.3 | 98.85 | 8.1 | 2 ^m B |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (11)... β (*Mon. Not.* XXXIII, 351)...*Annals Harvard Obs.*, 510)...*Boothroyd* 13181...]

 β 1264. *Lalande 43933*

R.A. 22^h 24^m 1^s
Decl. - 57° 18' 3"

| | | | | | |
|---------|------|------|-----|------|------------------|
| 1891.79 | 21.7 | 3.55 | 7.8 | 13.3 | 3 ^m B |
| 1898.83 | 19.8 | 4.17 | 7.9 | 13.3 | 3 ^m A |

Discovered with the 36-inch. It is 1^m 24' f and 9' n of ξ Aquarii.

[β (11)... β (*Mon. Not.* XXXIII, 351)...*Annals Harvard Obs.*, 510)...]

 β 702. *Gliese 702*

R.A. 22^h 24^m 1^s
Decl. - 57° 18' 3"

A and B

| | | | | |
|---------|-------|-------|------|------------------|
| 1878.65 | 285.7 | 16.37 | 13.6 | 2 ^m B |
| 1898.81 | 286.2 | 16.84 | 13.6 | 3 ^m B |

| | | | | | | |
|---------|-------|------|--------|------|-----|-----|
| 1876.05 | 213.8 | 2.05 | 9.5 | 10.3 | 35 | J |
| 1879.58 | 213.8 | 2.02 | 3.5... | ... | 35 | Win |
| 1885.82 | 213.3 | 2.05 | 3.0... | ... | 35 | C |
| 1886.31 | 212.9 | 2.71 | 3.1... | 8.7 | 33 | 1 M |
| 1888.72 | 212.1 | 2.40 | 3.2... | ... | 33 | Lv |
| 1888.75 | 213.3 | 2.77 | 8.5... | 8.7 | 32 | 2 |
| 1890.78 | 211.5 | 2.88 | ... | ... | 32 | 1 |
| 1892.63 | 200.6 | 4.75 | ... | ... | 29 | 1 |
| 1893.59 | 211.1 | ... | 8.8... | 0.5 | 40 | 1 |
| 1893.62 | 215.8 | 2.75 | ... | ... | ... | 2 |
| 1898.63 | 214.4 | 2.51 | 3.0... | 8.5 | 29 | 1 |

B and C

| | | | | | |
|---------|-------|-------|------|-----|----------------|
| 1877.53 | 225.6 | 28.80 | 13.5 | 3.6 | β |
| 1877.54 | 225.6 | 28.58 | 16.8 | 4.6 | D |
| 1877.55 | 225.6 | 28.23 | 19.0 | 5.2 | C ₂ |
| 1877.56 | 225.6 | 28.23 | 19.0 | 2.9 | Bd |

Discovered with the 6-inch. No sensible change.

[β (m) ... β (6-inch aperture).]

[β (m) ... β (6-inch aperture) ... β (1875) ... β (1876) ...
of 10 ... β (1) ... β (1875) ... Wilson (1875) ... L.M. ... L.V. ...
... β (1875) ... β (1875) ... β (1875) ... β (1875) ...
little (Pars. Flower Obs.) ...]

 β 705. L.M. 107-11135

R.A. 22° 29' 40" E
Decl. + 49° 42' S

| | | | | | |
|---------|---------|---------|---------|---------|---------|
| 1877.53 | 1877.54 | 1877.55 | 1877.56 | 1877.57 | 1877.58 |
| 225.6 | 225.6 | 225.6 | 225.6 | 225.6 | 225.6 |
| 28.80 | 28.58 | 28.23 | 28.23 | 28.23 | 28.23 |
| 13.5 | 16.8 | 19.0 | 19.0 | 19.0 | 19.0 |
| 3.6 | 4.6 | 5.2 | 5.2 | 5.2 | 5.2 |
| β | β | β | β | β | β |

Discovered with the 18½-inch. A difficult object with that aperture. I could not see it on one night in 1898 with the 40-inch. It should be watched with large instruments.

[β (x) ... β ... H Σ () ...]

 β 707. L.M. 107-11135

R.A. 22° 29' 40" E
Decl. + 49° 42' S

| | | | | | | |
|---------|------|------|-----|------|-----|---------|
| 1878.47 | 46.6 | 1.86 | 8.0 | 10.5 | 1.9 | β |
| 1878.48 | 46.6 | 1.86 | 8.0 | 10.5 | 1.9 | β |

Discovered with the 18½-inch.

[β (m) ... β ...]

 β 706. L.M. 107-11135

R.A. 22° 29' 40" E
Decl. + 49° 42' S

A and B

| | | | | | |
|---------|---------|---------|---------|---------|---------|
| 1877.53 | 1877.54 | 1877.55 | 1877.56 | 1877.57 | 1877.58 |
| 225.6 | 225.6 | 225.6 | 225.6 | 225.6 | 225.6 |
| 28.80 | 28.58 | 28.23 | 28.23 | 28.23 | 28.23 |
| 13.5 | 16.8 | 19.0 | 19.0 | 19.0 | 19.0 |
| 3.6 | 4.6 | 5.2 | 5.2 | 5.2 | 5.2 |
| β | β | β | β | β | β |

A and C

| | | | | | |
|---------|-------|-------|------|-----|---------|
| 1877.53 | 225.6 | 28.80 | 13.5 | 3.6 | β |
| 1881.67 | 235.8 | 29.17 | 11.0 | 2.9 | β |
| 1891.88 | 252.9 | 29.35 | 11.7 | 2.9 | β |
| 1898.64 | 252.9 | 29.77 | 11.0 | 2.9 | β |

Discovered with the 18½-inch. The angle of AC in my measures of 1881 is undoubtedly an error in printing, and should be 255.8, but I have not the original record to refer to. β 708 is closely f .

[β (x) ... β ... β (1814) ... β (1814) ... β (1814) ...]

 β 708. L.M. 107-11135

R.A. 22° 30' 42" E
Decl. + 49° 43' S

| | | | | | | |
|---------|-------|------|-----|------|-----|---------|
| 1877.55 | 288.6 | 8.78 | 9.0 | 11.5 | 1.9 | β |
| 1892.78 | 289.6 | 8.78 | 9.0 | 12.0 | 1.9 | W |
| 1898.63 | 288.4 | 8.56 | 8.7 | 12.0 | 2.9 | β |

Discovered with the 18½-inch. β 706 is in the field p .

[β (x) ... β ... Wilson () ...]

 β 175. L.M. 174-1970

R.A. 22° 29' 40" E
Decl. + 49° 42' S

| | | | | | | |
|---------|-------|------|------|------|-----|---|
| 1875.65 | 138.9 | 1.44 | 10.3 | 10.5 | 3.9 | J |
| 1893.82 | 138.4 | 1.58 | 10.5 | 10.5 | 3.9 | W |

Discovered with the 6-inch.

[β (m) ... β (Mon. Not. XXXIV, 59) ... β (1) ... Wilson () ...]

 β 771. σ^3 Grus

R.A. 22° 29' 40" E
Decl. + 49° 42' S

| | | | | |
|---------|-------|------|------------|-------------|
| 1879.64 | 27 | 1.3± | 6.0...10.5 | β |
| 1891.82 | 259.1 | 2.22 | .. | 2.9 Sel |
| 1891.87 | 263.1 | 2.46 | 6.7...13.6 | 3.9 β |
| 1897.04 | 265.1 | 2.38 | 7.0...12.5 | 3.9 See |

Discovered with the 6-inch at Mt. Hamilton in 1879. The *Cape Catalogue* gives this star a proper motion of 0.096 in the direction of 339.4. The Cordoba magnitude is 6.0.

[β (m) ... β (1814) ... β (1814) ... β (1814) ...
... See (3496) ...]

β 1092. K₂O = 76.8 ———

R.A. 22 58 5.6
Decl. -72 18 9

A and B

| | | | | | | |
|---------|-------|------|-----|-----|---------|-----------|
| 1889.30 | 237.1 | 0.32 | 7.5 | 7.5 | 2 π | β |
| 1899.71 | 229.5 | 0.14 | 7.7 | 7.7 | 1 π | Λ |

AB and C₆₀ H mass.

| | | | | | | |
|---------|-------|-------|-----|--------|----|---------|
| 1830 | 272.0 | 12± | 8.5 | 1.13 | 17 | H |
| 1889.31 | 264.0 | 29.19 | ... | 12.2 | 37 | β |
| 1898.71 | 263.6 | 30.35 | 7.2 | 1.12.3 | 37 | A |
| 1898.77 | 263.2 | 30.07 | 7.0 | 1.12.8 | 17 | β |

AB and D (C. H. V. 944)

| | | | | | |
|---------|-------|----------|-----|------|----|
| 1783.20 | 135.2 | 41.07 | ... | 1.00 | H |
| 1830 | 40.4 | 30 \pm | 7.5 | 9.5 | H |
| 1875.13 | 137.6 | 42.18 | 7.0 | 7.7 | SH |
| 1883.18 | 137.7 | 42.19 | 7.0 | 7.6 | SH |
| 1889.31 | 137.4 | 42.17 | 7.2 | 7.2 | SH |
| 1898.66 | 137.8 | 42.42 | 7.2 | 7.2 | SH |
| 1898.77 | 137.0 | 41.07 | ... | 8.0 | A |

The close pair was discovered with the 36-inch. The wide pair is evidently unchanged. This is, $H^1 V. 94 = H 3133 = O\delta$ (App.) 236. There is an error of 90° in the angle of D as given by HERSCHEL II in his *Fifth Catalogue*. There is also an error of 7° R.A. and $29'$ Decl. in the place of this star, as given by HERSCHEL I. The foregoing are all the measures of the distant companions. D is Radcliffe 5779. The very recent measures of A by AITKEN with the 36-inch (power 1900) show decided change in angle and distance. It is probably in rapid motion.

[β (xv)... β (2929)... β (*Pub. L. O.* 11)...Franz (2650)...J
(1)...Aitken ()...]

β 277. 1.000.34 44348

Decl. + 1. 18. 1.

| | | | | | | |
|---------|-------|------|--------|-----|----|-------|
| 1875.35 | 199.1 | 0.50 | 8.2... | 8.4 | 25 | J |
| 1879.46 | 199.3 | 0.51 | 8.0... | 8.3 | 19 | B |
| 1882.68 | 168.5 | 0.55 | 8.2... | 8.4 | 19 | Green |
| 1893.54 | 201.9 | 0.49 | 8.0... | 8.4 | 19 | Lv |
| 1893.65 | 204.6 | 0.58 | 8.2... | 8.4 | 39 | W |

Discovered with the 6-inch. Very little, if any, change. A faint star about 30' distant. It is the δ star of a wide pair.

[β (v)... β (*Mon. Not.* xxxv, 31)... β^3 ...J (1)...Perry (*Eng. Mech.* xxxv, 195-196) / 189-190, 190-191, 191-192, 192-193, 193-194, 194-195, 195-196, 196-197, 197-198, 198-199, 199-200, 200-201, 201-202, 202-203, 203-204, 204-205, 205-206, 206-207, 207-208, 208-209, 209-210, 210-211, 211-212, 212-213, 213-214, 214-215, 215-216, 216-217, 217-218, 218-219, 219-220, 220-221, 221-222, 222-223, 223-224, 224-225, 225-226, 226-227, 227-228, 228-229, 229-230, 230-231, 231-232, 232-233, 233-234, 234-235, 235-236, 236-237, 237-238, 238-239, 239-240, 240-241, 241-242, 242-243, 243-244, 244-245, 245-246, 246-247, 247-248, 248-249, 249-250, 250-251, 251-252, 252-253, 253-254, 254-255, 255-256, 256-257, 257-258, 258-259, 259-260, 260-261, 261-262, 262-263, 263-264, 264-265, 265-266, 266-267, 267-268, 268-269, 269-270, 270-271, 271-272, 272-273, 273-274, 274-275, 275-276, 276-277, 277-278, 278-279, 279-280, 280-281, 281-282, 282-283, 283-284, 284-285, 285-286, 286-287, 287-288, 288-289, 289-290, 290-291, 291-292, 292-293, 293-294, 294-295, 295-296, 296-297, 297-298, 298-299, 299-300, 300-301, 301-302, 302-303, 303-304, 304-305, 305-306, 306-307, 307-308, 308-309, 309-310, 310-311, 311-312, 312-313, 313-314, 314-315, 315-316, 316-317, 317-318, 318-319, 319-320, 320-321, 321-322, 322-323, 323-324, 324-325, 325-326, 326-327, 327-328, 328-329, 329-330, 330-331, 331-332, 332-333, 333-334, 334-335, 335-336, 336-337, 337-338, 338-339, 339-340, 340-341, 341-342, 342-343, 343-344, 344-345, 345-346, 346-347, 347-348, 348-349, 349-350, 350-351, 351-352, 352-353, 353-354, 354-355, 355-356, 356-357, 357-358, 358-359, 359-360, 360-361, 361-362, 362-363, 363-364, 364-365, 365-366, 366-367, 367-368, 368-369, 369-370, 370-371, 371-372, 372-373, 373-374, 374-375, 375-376, 376-377, 377-378, 378-379, 379-380, 380-381, 381-382, 382-383, 383-384, 384-385, 385-386, 386-387, 387-388, 388-389, 389-390, 390-391, 391-392, 392-393, 393-394, 394-395, 395-396, 396-397, 397-398, 398-399, 399-400, 400-401, 401-402, 402-403, 403-404, 404-405, 405-406, 406-407, 407-408, 408-409, 409-410, 410-411, 411-412, 412-413, 413-414, 414-415, 415-416, 416-417, 417-418, 418-419, 419-420, 420-421, 421-422, 422-423, 423-424, 424-425, 425-426, 426-427, 427-428, 428-429, 429-430, 430-431, 431-432, 432-433, 433-434, 434-435, 435-436, 436-437, 437-438, 438-439, 439-440, 440-441, 441-442, 442-443, 443-444, 444-445, 445-446, 446-447, 447-448, 448-449, 449-450, 450-451, 451-452, 452-453, 453-454, 454-455, 455-456, 456-457, 457-458, 458-459, 459-460, 460-461, 461-462, 462-463, 463-464, 464-465, 465-466, 466-467, 467-468, 468-469, 469-470, 470-471, 471-472, 472-473, 473-474, 474-475, 475-476, 476-477, 477-478, 478-479, 479-480, 480-481, 481-482, 482-483, 483-484, 484-485, 485-486, 486-487, 487-488, 488-489, 489-490, 490-491, 491-492, 492-493, 493-494, 494-495, 495-496, 496-497, 497-498, 498-499, 499-500, 500-501, 501-502, 502-503, 503-504, 504-505, 505-506, 506-507, 507-508, 508-509, 509-510, 510-511, 511-512, 512-513, 513-514, 514-515, 515-516, 516-517, 517-518, 518-519, 519-520, 520-521, 521-522, 522-523, 523-524, 524-525, 525-526, 526-527, 527-528, 528-529, 529-530, 530-531, 531-532, 532-533, 533-534, 534-535, 535-536, 536-537, 537-538, 538-539, 539-540, 540-541, 541-542, 542-543, 543-544, 544-545, 545-546, 546-547, 547-548, 548-549, 549-550, 550-551, 551-552, 552-553, 553-554, 554-555, 555-556, 556-557, 557-558, 558-559, 559-560, 560-561, 561-562, 562-563, 563-564, 564-565, 565-566, 566-567, 567-568, 568-569, 569-570, 570-571, 571-572, 572-573, 573-574, 574-575, 575-576, 576-577, 577-578, 578-579, 579-580, 580-581, 581-582, 582-583, 583-584, 584-585, 585-586, 586-587, 587-588, 588-589, 589-590, 590-591, 591-592, 592-593, 593-594, 594-595, 595-596, 596-597, 597-598, 598-599, 599-600, 600-601, 601-602, 602-603, 603-604, 604-605, 605-606, 606-607, 607-608, 608-609, 609-610, 610-611, 611-612, 612-613, 613-614, 614-615, 615-616, 616-617, 617-618, 618-619, 619-620, 620-621, 621-622, 622-623, 623-624, 624-625, 625-626, 626-627, 627-628, 628-629, 629-630, 630-631, 631-632, 632-633, 633-634, 634-635, 635-636,

β 480. W. ANN. 1911

11. A 22-yr-old 18-yr-old
Dress, 22-yr-old 18-yr-old

| | | | | | | |
|---------|--------|------|------|-----|----|---|
| 1877.51 | 0.5, 6 | 0.86 | 0.21 | 0.8 | 35 | J |
| 1891.50 | 0.3, 5 | 0.86 | 0.21 | 0.8 | 39 | B |

Discovered with the 6-inch. So far unchanged.

$$[\beta(IV) \dots \beta(Mon), N(\alpha XXXVIII), 78 \dots \beta(III)] = [\beta(Ia) \dots$$

 $O, II) \dots J(i) \dots]$

β 1265. D. M. 1911. 2425

R.A. 22^h 35^m 18^s (1950)
Decl. \rightarrow 60° 47' 00"

15 and 16

| | | | | | | |
|---------|-------|------|-----|-----|----|---|
| 1891.58 | 251.4 | 0.56 | 0.1 | 0.2 | 3% | B |
| 1898.79 | 251.2 | 0.56 | 0.7 | 0.7 | 3% | A |

A and BC

| | | | | | |
|---------|-------|-------|------|-----|---|
| 1891.58 | 346.3 | 39.69 | 8.8. | 3.5 | 3 |
| 1898.79 | 346.7 | 39.76 | 9.0. | 3.5 | 3 |

Discovered with the 36-inch. So far without sensible change.

[β (XVIII)... β (3113)... β (*Pub. L. O.* II)...Aitken ()...]

β 700. 2. 11. 1937

| | | | | |
|------|-----|----|----|---|
| K.A. | 22 | 55 | 20 | 7 |
| Deed | 100 | 5 | 10 | 5 |

| | | | | | | |
|---------|-----|------|--------|------|-----|-----|
| 1887.17 | 5.9 | 2.04 | 8.5 | 9.7 | 3.9 | 3 |
| 1886.79 | 6.0 | 2.13 | 8.2... | 9.0 | 2.7 | LM |
| 1888.89 | 5.1 | 1.50 | 8.3 | 9.4 | 1.9 | 1.5 |
| 1893.74 | 4.4 | 1.05 | 8.7 | 10.0 | 2.5 | G |
| 1896.81 | 5.4 | 2.04 | 8.3 | 10.4 | 3.5 | 2.8 |
| 1898.64 | 6.0 | 2.13 | 8.5 | 10.7 | 3.9 | 3 |

Discovered with the 185 line. Apparently unchanged.

...Cogshall ()...

A and B ($\approx \Sigma 2942$)

| | | | | | |
|---------|-------|------|--------|-----|-------------------------|
| 1831.61 | 282.1 | 2.66 | 7.0... | 9.2 | 4 ^m Σ |
| 1869.52 | 280.3 | 2.83 | 6.2... | 8.5 | 6 ^m J |
| 1878.97 | 280.2 | 2.68 | 6.8... | 8.5 | 2 ^m β |
| 1883.21 | 282.0 | 3.04 | 6.8... | 9.6 | 6 ^m En |
| 1895.91 | 277.1 | 2.85 | ... | ... | 2 ^m Maw |

The small star was noted with the 18½-inch. There is no change in AB ($\approx \Sigma 2942 = H 1802 = O\Sigma 478$). Only a few of the measures are given.

[β (VIII)... β (Am. Jour. Sci. July 1877)... β^1 ... β^2 ...Lv (A. J. 382)...Madler (*Fixstern-Systeme* I) (*Dorpat Obs.* XI)...Dawes (*Mem. R. A. S.* XXXV)...*Obs.* at *Barclay's Obs.* I...O\Sigma (*Poulkova Obs.* IX)... Δ (II)... Δ (1736, 1979)...Wilson and Seabroke (*Mem. R. A. S.* XLII)...Bigourdan (*Paris Obs.* 1883)...Engelmann (2678)...Glase-napp (III)...Maw (*Mem. R. A. S.* LIII)...]

 β 711. D.M. (10°) 4812

R.A. 22^h 30^m 20^s $\frac{1}{2}$
Decl. + 10. 34 $\frac{1}{2}$

| | | | | | |
|---------|------|------|--------|------|------------------------|
| 1878.59 | 79.9 | 0.72 | 8.5... | 10.5 | 1 ^m β |
| 1891.88 | 55.3 | 0.83 | 9.0... | 9.9 | 3 ^m β |
| 1893.70 | 53.4 | 1.24 | 9.5... | 10.5 | 1 ^m W |
| 1897.76 | 46.4 | 0.72 | ... | ... | 1 ^m Bow |
| 1897.83 | 46.6 | 0.96 | 10... | 11 | 1 ^m Br |
| 1898.73 | 42.7 | 1.00 | ... | ... | 1 ^m Bow |
| 1898.74 | 47.6 | 0.99 | ... | ... | 3 ^m A |
| 1898.79 | 45.1 | 1.00 | ... | ... | 1 ^m Bry |
| 1898.89 | 39.8 | 0.82 | ... | ... | 1 ^m Lew |

Discovered with the 18½-inch. There is considerable angular motion, an unusual condition in a pair of stars of this magnitude, and suggesting comparative nearness. The magnitude in D.M. is 9.1. It is 27^s ρ a 7 m star.

[β (X)... β^1 ... β (3114)... β (*Pub. L. O.* II)...Wilson ()...Aitken (3585)...Lewis, Bowyer and Bryant (*Mon. Not. LIX*, 400)...Brown ()...]

 β 1037. W¹ XXII. 854

R.A. 22^h 41^m 56^s $\frac{1}{2}$
Decl. + 12. 22 $\frac{1}{2}$

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1888.81 | 224.4 | 0.66 | 8.7... | 10.8 | 1 ^m β |
| 1890.52 | 215.2 | 0.72 | 8.9... | 11.5 | 1 ^m A |

Discovered with the 36-inch. The ρ star of a wide pair. Change in angle?

[β (XIV)... β (2875)... β (2525, *L. O.* I)...Aitken ()...]

 β 1219. S.D. (11) 15931

R.A. 22^h 42^m 27^s $\frac{1}{2}$
Decl. - 11. 42 $\frac{1}{2}$

| | | | | | |
|---------|-------|------|--------|-----|------------------------|
| 1890.82 | 397.9 | 0.54 | 8.7... | 9.4 | 3 ^m β |
| 1896.87 | 299.3 | 0.48 | ... | ... | 3 ^m A |

Discovered with the 12-inch; a difficult pair with that aperture. There is a 6^s pair np 5'.

[β (XVII)... β (3047)... β (*Pub. L. O.* II)...Aitken (3466)...]

 β 1145. O. Arg. N. 24690

R.A. 22^h 42^m 45^s $\frac{1}{2}$
Decl. + 57° 55' $\frac{1}{2}$

A and B

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1889.59 | 153.0 | 1.03 | 8.2... | 11.0 | 3 ^m β |
| 1898.88 | 156.3 | 1.06 | 8.0... | 11.2 | 2 ^m A |

A and C

| | | | | | |
|---------|-------|-------|-----|------|------------------------|
| 1889.59 | 170.5 | 21.00 | ... | 9.5 | 3 ^m β |
| 1898.82 | 170.7 | 22.27 | ... | 10.0 | 3 ^m A |

Discovered with the 36-inch.

[β (XVI)... β (2450)... β (*Pub. L. O.* II)...Aitken (3485)...]

 β 1146. W¹ XXII. 971

R.A. 22^h 42^m 46^s $\frac{1}{2}$
Decl. + 30° 28' $\frac{1}{2}$

| | | | | | |
|---------|-------|------|--------|-----|------------------------|
| 1889.55 | 335.3 | 0.23 | 7.2... | 8.2 | 3 ^m β |
| 1897.80 | 331.1 | 0.15 | ... | ... | 1 ^m Lew |
| 1898.50 | 313.0 | 0.18 | 7.6... | 8.2 | 4 ^m A |

Discovered with the 36-inch. Change in angle is probable.

[β (XV)... β (2450)... β (*Pub. L. O.* II)...Lewis, Brown, and LIX, 400)...Aitken ()...]

 β 846. Lalade 14685

R.A. 22^h 44^m 31^s $\frac{1}{2}$
Decl. - 23. 54 $\frac{1}{2}$

| | | | | | |
|---------|------|------|--------|------|------------------------|
| 1884.87 | 94.4 | 1.73 | 8.0... | 12.2 | 3 ^m β |
| 1886.84 | 94.8 | 2.11 | ... | ... | 3 ^m UL |
| 1888.82 | 62.2 | 1.07 | 8.2... | 12.3 | 3 ^m C |

Discovered with the 12½-inch at the Washburn Observatory.

[β (XII)... β^1 ...Updegraff, Lamb and Comstock (*Pub. Washburn Obs.* V, VI)...]

General Catalogue of Double Stars

β 177. *Antares* (13000)

R.A. 16h 27m 10s
Decl. 24° 42' 30"

| Year | 1850 | 1860 | 1870 | 1880 | 1890 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 | 2160 | 2170 | 2180 | 2190 | 2200 | 2210 | 2220 | 2230 | 2240 | 2250 | 2260 | 2270 | 2280 | 2290 | 2300 | 2310 | 2320 | 2330 | 2340 | 2350 | 2360 | 2370 | 2380 | 2390 | 2400 | 2410 | 2420 | 2430 | 2440 | 2450 | 2460 | 2470 | 2480 | 2490 | 2500 | 2510 | 2520 | 2530 | 2540 | 2550 | 2560 | 2570 | 2580 | 2590 | 2600 | 2610 | 2620 | 2630 | 2640 | 2650 | 2660 | 2670 | 2680 | 2690 | 2700 | 2710 | 2720 | 2730 | 2740 | 2750 | 2760 | 2770 | 2780 | 2790 | 2800 | 2810 | 2820 | 2830 | 2840 | 2850 | 2860 | 2870 | 2880 | 2890 | 2900 | 2910 | 2920 | 2930 | 2940 | 2950 | 2960 | 2970 | 2980 | 2990 | 3000 | 3010 | 3020 | 3030 | 3040 | 3050 | 3060 | 3070 | 3080 | 3090 | 3100 | 3110 | 3120 | 3130 | 3140 | 3150 | 3160 | 3170 | 3180 | 3190 | 3200 | 3210 | 3220 | 3230 | 3240 | 3250 | 3260 | 3270 | 3280 | 3290 | 3300 | 3310 | 3320 | 3330 | 3340 | 3350 | 3360 | 3370 | 3380 | 3390 | 3400 | 3410 | 3420 | 3430 | 3440 | 3450 | 3460 | 3470 | 3480 | 3490 | 3500 | 3510 | 3520 | 3530 | 3540 | 3550 | 3560 | 3570 | 3580 | 3590 | 3600 | 3610 | 3620 | 3630 | 3640 | 3650 | 3660 | 3670 | 3680 | 3690 | 3700 | 3710 | 3720 | 3730 | 3740 | 3750 | 3760 | 3770 | 3780 | 3790 | 3800 | 3810 | 3820 | 3830 | 3840 | 3850 | 3860 | 3870 | 3880 | 3890 | 3900 | 3910 | 3920 | 3930 | 3940 | 3950 | 3960 | 3970 | 3980 | 3990 | 4000 | 4010 | 4020 | 4030 | 4040 | 4050 | 4060 | 4070 | 4080 | 4090 | 4100 | 4110 | 4120 | 4130 | 4140 | 4150 | 4160 | 4170 | 4180 | 4190 | 4200 | 4210 | 4220 | 4230 | 4240 | 4250 | 4260 | 4270 | 4280 | 4290 | 4300 | 4310 | 4320 | 4330 | 4340 | 4350 | 4360 | 4370 | 4380 | 4390 | 4400 | 4410 | 4420 | 4430 | 4440 | 4450 | 4460 | 4470 | 4480 | 4490 | 4500 | 4510 | 4520 | 4530 | 4540 | 4550 | 4560 | 4570 | 4580 | 4590 | 4600 | 4610 | 4620 | 4630 | 4640 | 4650 | 4660 | 4670 | 4680 | 4690 | 4700 | 4710 | 4720 | 4730 | 4740 | 4750 | 4760 | 4770 | 4780 | 4790 | 4800 | 4810 | 4820 | 4830 | 4840 | 4850 | 4860 | 4870 | 4880 | 4890 | 4900 | 4910 | 4920 | 4930 | 4940 | 4950 | 4960 | 4970 | 4980 | 4990 | 5000 | 5010 | 5020 | 5030 | 5040 | 5050 | 5060 | 5070 | 5080 | 5090 | 5100 | 5110 | 5120 | 5130 | 5140 | 5150 | 5160 | 5170 | 5180 | 5190 | 5200 | 5210 | 5220 | 5230 | 5240 | 5250 | 5260 | 5270 | 5280 | 5290 | 5300 | 5310 | 5320 | 5330 | 5340 | 5350 | 5360 | 5370 | 5380 | 5390 | 5400 | 5410 | 5420 | 5430 | 5440 | 5450 | 5460 | 5470 | 5480 | 5490 | 5500 | 5510 | 5520 | 5530 | 5540 | 5550 | 5560 | 5570 | 5580 | 5590 | 5600 | 5610 | 5620 | 5630 | 5640 | 5650 | 5660 | 5670 | 5680 | 5690 | 5700 | 5710 | 5720 | 5730 | 5740 | 5750 | 5760 | 5770 | 5780 | 5790 | 5800 | 5810 | 5820 | 5830 | 5840 | 5850 | 5860 | 5870 | 5880 | 5890 | 5900 | 5910 | 5920 | 5930 | 5940 | 5950 | 5960 | 5970 | 5980 | 5990 | 6000 | 6010 | 6020 | 6030 | 6040 | 6050 | 6060 | 6070 | 6080 | 6090 | 6100 | 6110 | 6120 | 6130 | 6140 | 6150 | 6160 | 6170 | 6180 | 6190 | 6200 | 6210 | 6220 | 6230 | 6240 | 6250 | 6260 | 6270 | 6280 | 6290 | 6300 | 6310 | 6320 | 6330 | 6340 | 6350 | 6360 | 6370 | 6380 | 6390 | 6400 | 6410 | 6420 | 6430 | 6440 | 6450 | 6460 | 6470 | 6480 | 6490 | 6500 | 6510 | 6520 | 6530 | 6540 | 6550 | 6560 | 6570 | 6580 | 6590 | 6600 | 6610 | 6620 | 6630 | 6640 | 6650 | 6660 | 6670 | 6680 | 6690 | 6700 | 6710 | 6720 | 6730 | 6740 | 6750 | 6760 | 6770 | 6780 | 6790 | 6800 | 6810 | 6820 | 6830 | 6840 | 6850 | 6860 | 6870 | 6880 | 6890 | 6900 | 6910 | 6920 | 6930 | 6940 | 6950 | 6960 | 6970 | 6980 | 6990 | 7000 | 7010 | 7020 | 7030 | 7040 | 7050 | 7060 | 7070 | 7080 | 7090 | 7100 | 7110 | 7120 | 7130 | 7140 | 7150 | 7160 | 7170 | 7180 | 7190 | 7200 | 7210 | 7220 | 7230 | 7240 | 7250 | 7260 | 7270 | 7280 | 7290 | 7300 | 7310 | 7320 | 7330 | 7340 | 7350 | 7360 | 7370 | 7380 | 7390 | 7400 | 7410 | 7420 | 7430 | 7440 | 7450 | 7460 | 7470 | 7480 | 7490 | 7500 | 7510 | 7520 | 7530 | 7540 | 7550 | 7560 | 7570 | 7580 | 7590 | 7600 | 7610 | 7620 | 7630 | 7640 | 7650 | 7660 | 7670 | 7680 | 7690 | 7700 | 7710 | 7720 | 7730 | 7740 | 7750 | 7760 | 7770 | 7780 | 7790 | 7800 | 7810 | 7820 | 7830 | 7840 | 7850 | 7860 | 7870 | 7880 | 7890 | 7900 | 7910 | 7920 | 7930 | 7940 | 7950 | 7960 | 7970 | 7980 | 7990 | 8000 | 8010 | 8020 | 8030 | 8040 | 8050 | 8060 | 8070 | 8080 | 8090 | 8100 | 8110 | 8120 | 8130 | 8140 | 8150 | 8160 | 8170 | 8180 | 8190 | 8200 | 8210 | 8220 | 8230 | 8240 | 8250 | 8260 | 8270 | 8280 | 8290 | 8300 | 8310 | 8320 | 8330 | 8340 | 8350 | 8360 | 8370 | 8380 | 8390 | 8400 | 8410 | 8420 | 8430 | 8440 | 8450 | 8460 | 8470 | 8480 | 8490 | 8500 | 8510 | 8520 | 8530 | 8540 | 8550 | 8560 | 8570 | 8580 | 8590 | 8600 | 8610 | 8620 | 8630 | 8640 | 8650 | 8660 | 8670 | 8680 | 8690 | 8700 | 8710 | 8720 | 8730 | 8740 | 8750 | 8760 | 8770 | 8780 | 8790 | 8800 | 8810 | 8820 | 8830 | 8840 | 8850 | 8860 | 8870 | 8880 | 8890 | 8900 | 8910 | 8920 | 8930 | 8940 | 8950 | 8960 | 8970 | 8980 | 8990 | 9000 | 9010 | 9020 | 9030 | 9040 | 9050 | 9060 | 9070 | 9080 | 9090 | 9100 | 9110 | 9120 | 9130 | 9140 | 9150 | 9160 | 9170 | 9180 | 9190 | 9200 | 9210 | 9220 | 9230 | 9240 | 9250 | 9260 | 9270 | 9280 | 9290 | 9300 | 9310 | 9320 | 9330 | 9340 | 9350 | 9360 | 9370 | 9380 | 9390 | 9400 | 9410 | 9420 | 9430 | 9440 | 9450 | 9460 | 9470 | 9480 | 9490 | 9500 | 9510 | 9520 | 9530 | 9540 | 9550 | 9560 | 9570 | 9580 | 9590 | 9600 | 9610 | 9620 | 9630 | 9640 | 9650 | 9660 | 9670 | 9680 | 9690 | 9700 | 9710 | 9720 | 9730 | 9740 | 9750 | 9760 | 9770 | 9780 | 9790 | 9800 | 9810 | 9820 | 9830 | 9840 | 9850 | 9860 | 9870 | 9880 | 9890 | 9900 | 9910 | 9920 | 9930 | 9940 | 9950 | 9960 | 9970 | 9980 | 9990 | 10000 | 10010 | 10020 | 10030 | 10040 | 10050 | 10060 | 10070 | 10080 | 10090 | 10100 | 10110 | 10120 | 10130 | 10140 | 10150 | 10160 | 10170 | 10180 | 10190 | 10200 | 10210 | 10220 | 10230 | 10240 | 10250 | 10260 | 10270 | 10280 | 10290 | 10300 | 10310 | 10320 | 10330 | 10340 | 10350 | 10360 | 10370 | 10380 | 10390 | 10400 | 10410 | 10420 | 10430 | 10440 | 10450 | 10460 | 10470 | 10480 | 10490 | 10500 | 10510 | 10520 | 10530 | 10540 | 10550 | 10560 | 10570 | 10580 | 10590 | 10600 | 10610 | 10620 | 10630 | 10640 | 10650 | 10660 | 10670 | 10680 | 10690 | 10700 | 10710 | 10720 | 10730 | 10740 | 10750 | 10760 | 10770 | 10780 | 10790 | 10800 | 10810 | 10820 | 10830 | 10840 | 10850 | 10860 | 10870 | 10880 | 10890 | 10900 | 10910 | 10920 | 10930 | 10940 | 10950 | 10960 | 10970 | 10980 | 10990 | 11000 | 11010 | 11020 | 11030 | 11040 | 11050 | 11060 | 11070 | 11080 | 11090 | 11100 | 11110 | 11120 | 11130 | 11140 | 11150 | 11160 | 11170 | 11180 | 11190 | 11200 | 11210 | 11220 | 11230 | 11240 | 11250 | 11260 | 11270 | 11280 | 11290 | 11300 | 11310 | 11320 | 11330 | 11340 | 11350 | 11360 | 11370 | 11380 | 11390 | 11400 | 11410 | 11420 | 11430 | 11440 | 11450 | 11460 | 11470 | 11480 | 11490 | 11500 | 11510 | 11520 | 11530 | 11540 | 11550 | 11560 | 11570 | 11580 | 11590 | 11600 | 11610 | 11620 | 11630 | 11640 | 11650 | 11660 | 11670 | 11680 | 11690 | 11700 | 11710 | 11720 | 11730 | 11740 | 11750 | 11760 | 11770 | 11780 | 11790 | 11800 | 11810 | 11820 | 11830 | 11840 | 11850 | 11860 | 11870 | 11880 | 11890 | 11900 | 11910 | 11920 | 11930 | 11940 | 11950 | 11960 | 11970 | 11980 | 11990 | 12000 | 12010 | 12020 | 12030 | 12040 | 12050 | 12060 | 12070 | 12080 | 12090 | 12100 | 12110 | 12120 | 12130 | 12140 | 12150 | 12160 | 12170 | 12180 | 12190 | 12200 | 12210 | 12220 | 12230 | 12240 | 12250 | 12260 | 12270 | 12280 | 12290 | 12300 | 12310 | 12320 | 12330 | 12340 | 12350 | 12360 | 12370 | 12380 | 12390 | 12400 | 12410 | 12420 | 12430 | 12440 | 12450 | 12460 | 12470 | 12480 | 12490 | 12500 | 12510 | 12520 | 12530 | 12540 | 12550 | 12560 | 12570 | 12580 | 12590 | 12600 | 12610 | 12620 | 12630 | 12640 | 12650 | 12660 | 12670 | 12680 | 12690 | 12700 | 12710 | 12720 | 12730 | 12740 | 12750 | 12760 | 12770 | 12780 | 12790 | 12800 | 12810 | 12820 | 12830 | 12840 | 12850 | 12860 | 12870 | 12880 | 12890 | 12900 | 12910 | 12920 | 12930 | 12940 | 12950 | 12960 | 12970 | 12980 | 12990 | 13000 | 13010 | 13020 | 13030 | 13040 | 13050 | 13060 | 13070 | 13080 | 13090 | 13100 | 13110 | 13120 | 13130 | 13140 | 13150 | 13160 | 13170 | 13180 | 13190 | 13200 | 13210 | 13220 | 13230 | 13240 | 13250 | 13260 | 13270 | 13280 | 13290 | 13300 | 13310 | 13320 | 13330 | 13340 | 13350 | 13360 | 13370 | 13380 | 13390 | 13400 | 13410 | 13420 | 13430 | 13440 | 13450 | 13460 | 13470 | 13480 | 13490 | 13500 | 13510 | 13520 | 13530 | 13540 | 13550 | 13560 | 13570 | 13580 | 13590 | 13600 | 13610 | 13620 | 13630 | 13640 | 13650 | 13660 | 13670 | 13680 | 13690 | 13700 | 13710 | 13720 | 13730 | 13740 | 13750 | 13760 | 13770 | 13780 | 13790 | 13800 | 13810 | 13820 | 13830 | 13840 | 13850 | 13860 | 13870 | 13880 | 13890 | 13900 | 13910 | 13920 | 13930 | 13940 | 13950 | 13960 | 13970 | 13980 | 13990 | 14000 | 14010 | 14020 | 14030 | 14040 | 14050 | 14060 | 14070 | 14080 | 14090 | 14100 | 14110 | 14120 | 14130 | 14140 | 14150 | 14160 | 14170 | 14180 | 14190 | 14200 | 14210 | 14220 | 14230 | 14240 | 14250 | 14260 | 14270 | 14280 | 14290 | 14300 | 14310 | 14320 | 14330 | 14340 | 14350 | 14360 | 14370 | 14380 | 14390 | 14400 | 14410 | 14420 | 14430 | 14440 | 14450 | 14460 | 14470 | 14480 | 14490 | 14500 | 14510 | 14520 | 14530 | 14540 | 14550 | 14560 | 14570 | 14580 | 14590 | 14600 | 14610 | 14620 | 14630 | 14640 | 14650 | 14660 | 14670 | 14680 | 14690 | 14700 | 14710 | 14720 | 14730 | 14740 | 14750 | 14760 | 14770 | 14780 | 14790 | 14800 | 14810</ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-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Discovered with the 6-inch. The change, if any, is slow, but it can hardly fail to prove a binary. This is a naked-eye star in *Aquarius*. The Harvard photometric magnitude is 5.8. This star is B.A.C. 7986 (= Piazzii XXII. 250).

[β (III)... β (*Mon. Not.* XXXIV, 59)... δ (I)...Cin⁴...Cin⁵... Hough (2978)...LM...Lv³...Sp (III)...Tarrant (3186)...Cogshall ()...]

β 1010. Lalande 41832

R.A. 22^h 49^m 17^s $\frac{1}{2}$
Decl. - 6 13 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|-----|----------------|---------|
| 1881.85 | 136.5 | 1.21 | 8.5... | 8.9 | 2 ^m | β |
| 1886.55 | ... | 1.28 | 9.0... | 9.2 | 1 ^m | LM |
| 1892.89 | 134.8 | 1.28 | 8.7... | 9.0 | 1 ^m | Ho |
| 1899.72 | 136.8 | 1.11 | 8.8... | 9.3 | 2 ^m | D |

Discovered with the 12-inch at Mt. Hamilton in 1881.

[β (XII)... β^2 ...LM...Hough (3234)...Doolittle (*Pub. Flower Catalog*, II...)]

β 772. δ *Piscis Australis*

R.A. 22^h 49^m 18^s $\frac{1}{2}$
Decl. - 33 11 $\frac{1}{2}$

| | | | | | | |
|---------|-------|---------|--------|------|----------------|---------|
| 1877.70 | 236.5 | 4.73 | 5.0... | 10.5 | 1 ^m | Cin |
| 1879.69 | 238.4 | 5 \pm | 5.5... | 12.2 | 5 ^m | β |
| 1881.84 | 235.8 | 4.91 | 5.0... | 11.0 | 5 ^m | β |
| 1891.88 | 239.7 | 4.78 | 5.0... | 11.8 | 3 ^m | β |
| 1896.71 | 235.6 | 5.14 | ... | ... | 2 ^m | See |
| 1898.64 | 236.9 | 5.21 | 3.8... | 11.0 | 3 ^m | Cg |

Discovered with the 6-inch at Mt. Hamilton. There seems to be no material change. The *Cape Catalogue* gives the large star a proper motion of 0".09 in the direction of 360°.

[β (XI)... β^2 ... β^3 ... β (3114)... β (*Pub. L. O. II*)...Cin⁴... See (3496)...Cogshall ()...]

β 383. Lalande 44855

R.A. 22^h 49^m 57^s $\frac{1}{2}$
Decl. + 8° 49' $\frac{1}{2}$

A and B

| | | | | | | |
|---------|-------|------|--------|------|----------------|---------|
| 1877.82 | 119.6 | 2.07 | 8.0... | 11.0 | 1 ^m | β |
| 1891.80 | 118.7 | 2.58 | 8.0... | 12.7 | 3 ^m | β |

A and C

| | | | | | |
|---------|-------|-------|-----|----------------|----------------|
| 1877.81 | 240.3 | 15.59 | ... | 2 ^m | β |
| 1891.82 | 238.6 | 15.43 | ... | 12.4 | 3 ^m |

The distant star, C, was discovered with the 6-inch, and B added subsequently with the 18½-inch.

[β (V)... β (2092, 3114)... β^2 ... β (*Pub. L. O. III*)...]

β 848. D.M. (57°) 2639

R.A. 22^h 49^m 58^s $\frac{1}{2}$
Decl. + 57 11 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|------|----------------|---------|
| 1881.67 | 5.8 | 2.77 | 8.1... | 12.8 | 3 ^m | β |
| 1888.94 | 0.4 | 2.33 | 8.3... | 12.3 | 3 ^m | Com |
| 1895.84 | 358.9 | 2.64 | ... | ... | 2 ^m | Com |
| 1896.66 | 2.4 | 2.50 | ... | ... | 1 ^m | Com |
| 1898.82 | 359.6 | 2.80 | 8.5... | 12.5 | 1 ^m | A |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)... β^2 ...Comstock (*Pub. Mon. II*, 77)...(*Pub. Washburn Obs.*, VI, X)...Aitken ()...]

β 712. D.M. (48°) 2508

R.A. 22^h 49^m 58^s $\frac{1}{2}$
Decl. + 48 30 $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|--------|------|----------------|---------|
| 1877.58 | 291.6 | 1.02 | 9.0... | 9.5 | 1 ^m | β |
| 1877.70 | 290.3 | 1.11 | 9.7... | 10.2 | 1 ^m | J |
| 1893.72 | 293.5 | 1.24 | 9.5... | 10.1 | 3 ^m | W |
| 1899.66 | 288.7 | 2.94 | 9.0... | 10.0 | 1 ^m | D |

Discovered with the 18½-inch. In a small cluster.

[β (X)... β^2 ...J (I)...Wilson ()...Doolittle (*Pub. Flower Catalog*, III...)]

β 713. Lalande 44872

R.A. 22^h 50^m 55^s $\frac{1}{2}$
Decl. - 3 53 $\frac{1}{2}$

B and C

| | | | | | | |
|---------|------|-------|-----|------|----------------|---------|
| 1877.95 | 95.9 | 8.31 | ... | 12.5 | 1 ^m | β |
| 1891.82 | 94.1 | 10.18 | ... | 13.3 | 3 ^m | β |
| 1898.54 | 95.9 | 10.51 | ... | 12.5 | 2 ^m | β |

| 1851-1852 (1851-52) | | | | | |
|---------------------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

The faint star, C, was detected with the 18 $\frac{1}{2}$ -inch. The change in AB is obviously due to proper motion, and curiously this movement seems to belong, not to the large star, but to the small star B. The measures of 1852 and 1898 give for the apparent movement of B, 0.051 in the direction of 230.4, and this substantially accounts for the change in BC. A few of the measures of AB are given above.

| 1851-1852 (1851-52) | | | | | |
|---------------------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

 β 849. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory.

(20511)... β ... Comstock (*Pub. Washburn Obs.*, VI)...]

 β 852. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

Discovered with the 15 $\frac{1}{2}$ -inch.

(20511)... β ... Comstock (*Pub. Washburn Obs.*, VI)...]

 β 855. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

Discovered with the 15 $\frac{1}{2}$ -inch at the Washburn Observatory.

(20511)... β ... Comstock (*Pub. Washburn Obs.*, VI)...]

 β 170. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

An important pair noted with the 6-inch. KUSTNER gives the principal star a proper motion of 0.09 in the direction of 180°.

(20511)... β (Mon. Not. XXXIV, 59). Comstock (*Pub. Washburn Obs.*, VI)...]

 β 1011. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

Discovered with the 12-inch at Mt. Hamilton in 1851. Apparently fixed. The Cordoba magnitude is 6.6; YARNALL 6.4.

(20511)... β ... Comstock (*Pub. Washburn Obs.*, VI)...]

 β 384. (1851-52) (1851-52)

1851.53 127.0 3.74 8.4... 12.3 4ⁿ β

| | | | | | |
|---------|-------|------|--------|------|------------------------|
| 1851.53 | 127.0 | 3.74 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.00 | 128.0 | 3.75 | 8.4... | 12.3 | 4 ⁿ β |
| 1852.50 | 129.0 | 3.76 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.00 | 130.0 | 3.77 | 8.4... | 12.3 | 4 ⁿ β |
| 1853.50 | 131.0 | 3.78 | 8.4... | 12.3 | 4 ⁿ β |
| 1854.00 | 132.0 | 3.79 | 8.4... | 12.3 | 4 ⁿ β |

Discovered with the 6-inch. In GOULD 6.9 m.
Lalande 45047.

[β (vi)... β (2062)...d (i)...Cin³...Cin⁴...LM...Lx³...
See (3496)...Boothroyd ()...]

β 481. W¹ XXII, 1162

R.A. 22^h 50^m 28^s i
Decl. - 53° i

| | | | | | | |
|---------|------|------|--------|------|----------------|---------|
| 1878.19 | 51.8 | 1.30 | 9.0... | 9.5 | 2 ^m | β |
| 1886.74 | 54.9 | ... | 9.5... | 10.5 | 1 ^m | LM |
| 1891.88 | 53.1 | 1.19 | 9.1... | 9.6 | 3 ^m | β |
| 1898.76 | 51.7 | 1.31 | 9.7... | 10.0 | 3 ^m | Cg |

Discovered with the 6-inch. Σ 2970 is 17' 4" and 4' s.

[β (ix)... β (Mon. Not. XXXVIII, 78)... β^1 ... β (3114)... β (Pub. L. O. II)...LM...Cogshall ()...]

β 1147. 2 *Andromedae*

R.A. 22^h 57^m 57^s i
Decl. + 42° 7' i

| | | | | | | |
|---------|-------|------------|--------|-----|----------------|---------|
| 1889.54 | 317.8 | 0.28 | 5.0... | 8.7 | 3 ^m | β |
| 1890.62 | 313.0 | 0.27 | 5.2... | 9.0 | 3 ^m | β |
| 1891.72 | 323.4 | 0.23 | 5.7... | 8.5 | 3 ^m | β |
| 1892.99 | 318.2 | 0.40 \pm | ... | ... | 3 ^m | Sp |
| 1893.46 | 323.9 | 0.50 \pm | ... | ... | 2 ^m | Sp |
| 1896.03 | 322.0 | 0.42 \pm | ... | ... | 1 ^m | Sp |
| 1898.79 | 329.6 | 0.36 | ... | ... | 2 ^m | A |

This star was suspected to be a close pair with the 12-inch, and verified with the 36-inch. It is difficult with the large aperture. AUWERS gives the proper motion of 2 *Andromedae*, 0.041 in the direction of 109° 8. This belongs to both stars. It is a physical system, and should be in rapid motion.

[β (xvi)... β (2956, 3048, 3114)... β (Pub. L. O. II)...Sp (III)...Aitken (3585)...]

β 851. O. Arg. N. 25054

R.A. 22^h 57^m 30^s i
Decl. + 75° 29' i

| | | | | | | |
|---------|-------|------|--------|------|----------------|-------------|
| 1881.07 | 158.0 | 1.69 | 7.5... | 13.0 | 3 ^m | β |
| 1885.58 | 157.0 | 2.02 | ... | ... | 2 ^m | II Σ |
| 1888.92 | 160.4 | 2.14 | 7.3... | 13.0 | 3 ^m | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)... β^4 ...Comstock (Pub. Washburn Obs., vi)...II Σ ()...]

β 773. v *Grus*

R.A. 23^h 0^m 12^s i
Decl. - 39° 32' i

This star was suspected to be a close pair with the 6-inch at Mt. Hamilton in 1879. With the 12-inch in 1891 I could not be certain of any real elongation. It should receive further attention in southern latitudes.

[β (xii)... β^4 ...]

β 1025. Lalande 15312

R.A. 22^h 58^m 1^s i
Decl. + 12° 1' i

A and B

| | | | | | | |
|---------|-------|------|--------|------|----------------|---------|
| 1891.57 | 268.6 | 0.77 | 8.0... | 10.8 | 3 ^m | β |
| 1897.82 | 271.4 | 0.88 | ... | ... | 3 ^m | A |
| 1898.61 | 273.1 | 0.82 | 8.0... | 9.7 | 2 ^m | β |

A and C

| | | | | | | |
|---------|------|-------|-----|------|----------------|---------|
| 1891.57 | 84.3 | 22.16 | ... | 11.9 | 3 ^m | β |
| 1898.29 | 83.9 | 21.96 | ... | 12.0 | 3 ^m | β |

Discovered with the 18½-inch.

[β (xiii)... β^5 (Appo)... β (3114)... β (Pub. L. O. II)...Aitken (A. J. 420)...]

β 78. W¹ XXII, 1393

R.A. 23^h 2^m 4^s i
Decl. + 30° 49' i

A and B

| | | | | | | |
|---------|------|-------|--------|------|----------------|---------|
| 1879.57 | 53.0 | 17.22 | 7.2... | 11.0 | 1 ^m | β |
| 1893.25 | 54.9 | 18.18 | 7.0... | 11.0 | 2 ^m | W |

A and C

| | | | | | | |
|---------|------|-------|-----|------|----------------|---------|
| 1879.57 | 61.9 | 48.07 | ... | 11.5 | 1 ^m | β |
| 1893.25 | 62.2 | 47.28 | ... | 11.5 | 2 ^m | W |

Two distant companions noted with the 6-inch. In my measure of AB, the double distance, 34' 44, is given in β^1 .

[β (ii)... β^1 ...V...XXII, 1393...W...]

β 220. *U. A. C. 8170*

R.A. $10^h 24^m 57^s$
Decl. $-63^\circ 55'$

| | | | | | | |
|---------|------|-------|-----|------|----|---|
| 1876.60 | 27.6 | -7.4 | 5.5 | 11.5 | 29 | J |
| 1886.86 | 16.7 | -12.0 | 7.0 | 11.0 | 29 | T |
| 1896.93 | 16.7 | -12.5 | 6.9 | 11.0 | 45 | D |

Discovered with the 6-inch. No change.

(A. C. C. 8170. 500. 1880. 1882.) (A. C. C. 8170. 500. 1880. 1882.) (A. C. C. 8170. 500. 1880. 1882.)

 β 278. *U. A. C. 8188*

R.A. $10^h 18^m 20^s$
Decl. $-63^\circ 45'$

| | | | | | | |
|---------|-------|-------|-----|------|----|----|
| 1876.60 | 351.9 | 14.70 | 6.5 | 11.5 | 19 | OΣ |
| 1886.86 | 273.0 | 14.00 | 6.0 | 11.5 | 30 | B |
| 1896.93 | 274.2 | 14.00 | 6.0 | 11.5 | 30 | B |

Discovered with the 6.4-inch at the Dartmouth College Observatory. Evidently an error of 180° in the measure of OΣ. The proper motion of this star is very small, being in the direction of 247° (ATWERS). A naked-eye star in *Cassiopeia*; HEIS 6 m; Harvard photometry 6.3 m.

(A. C. C. 8188. 500. 1880. 1882.) (A. C. C. 8188. 500. 1880. 1882.) (A. C. C. 8188. 500. 1880. 1882.)

 β 718. *U. A. C. 8191*

R.A. $10^h 18^m 20^s$
Decl. $-63^\circ 45'$

| | | | | | | |
|---------|------|------|-----|------|----|----|
| 1876.60 | 88.3 | 0.47 | 5.0 | 11.5 | 19 | B |
| 1886.86 | 88.2 | 0.50 | 5.0 | 11.5 | 19 | J |
| 1896.93 | 85.9 | 0.60 | 6.0 | 8.0 | 19 | OΣ |
| 1876.60 | 86.5 | 0.47 | 5.0 | 11.5 | 19 | HS |
| 1886.86 | 85.8 | 0.63 | 5.8 | 7.0 | 19 | B |
| 1896.93 | 86.2 | 0.69 | 5.8 | 8.0 | 19 | B |
| 1876.60 | 85.8 | 0.72 | 5.8 | 8.0 | 19 | B |

Discovered with the $18\frac{1}{2}$ -inch. There is no relative change, but the components have in proper motion of $0^\circ 020$ in the direction 247° (ATWERS), and they therefore form a double star.

(A. C. C. 8191. 500. 1880. 1882.) (A. C. C. 8191. 500. 1880. 1882.) (A. C. C. 8191. 500. 1880. 1882.)

 β 854. *U. A. C. 8194*

R.A. $23^h 08^m 41^s$
Decl. $+5^\circ 23'$

| | | | | | | |
|---------|------|------|-----|-----|----|-----|
| 1881.60 | 00.0 | 2.10 | 8.7 | 8.7 | 39 | B |
| 1886.86 | 89.7 | 2.44 | 8.4 | 8.6 | 39 | U1 |
| 1887.70 | 87.0 | 2.38 | 8.4 | 8.6 | 39 | Com |
| 1888.82 | 88.3 | 1.80 | 8.5 | 8.3 | 19 | 1A |
| 1899.32 | 88.3 | 2.47 | 9.0 | 9.0 | 69 | D |

Discovered with the $15\frac{1}{2}$ -inch at the Washburn Observatory. Apparently without change.

[β (XII)... β ... Updegraff, Lamb and Comstock (*Pub. Washburn Obs.*, 3, 11) 1887. Doolittle (*Pub. Flower Obs.*, 1)...]

 β 710. *W. XXIII. 342*

R.A. $23^h 18^m 22^s$
Decl. $+13^\circ 39'$

| | | | | | | |
|---------|-------|------|-----|------|----|----|
| 1877.86 | 10.9 | 1.11 | 8.0 | 11.0 | 19 | B |
| 1887.79 | 8.3 | 1.31 | 7.2 | 11.0 | 29 | Ho |
| 1891.60 | 3.6 | 1.34 | 7.6 | 11.5 | 39 | B |
| 1895.71 | 354.6 | 1.47 | 7.0 | 11.0 | 19 | Ho |
| 1897.83 | 358.8 | 1.47 | 7.0 | 11.0 | 19 | Br |
| 1899.72 | 2.2 | 1.16 | 7.2 | 11.7 | 29 | D |

Discovered with the $18\frac{1}{2}$ -inch. In an unequal pair of this class, the apparent change in angle needs confirming. In my *Tenth Catalogue* this star was erroneously identified as W. XXIII. 363, and given with an error of $1^\circ 11'$ in the Decl. It was found independently by HODGE, and is Ho 341.

(A. C. C. 8194. 500. 1880. 1882.) (A. C. C. 8194. 500. 1880. 1882.) (A. C. C. 8194. 500. 1880. 1882.)

 β 386. *U. A. C. 8193*

R.A. $23^h 20^m 13^s$
Decl. $+7^\circ 13'$

| | | | | | | |
|---------|-------|-------|-----|------|----|---|
| 1876.97 | 312.3 | 20.68 | 6.5 | 11.0 | 19 | J |
| 1888.71 | 313.1 | 20.69 | 7.2 | 11.2 | 39 | B |
| 1899.05 | 313.1 | 19.91 | 6.6 | 10.8 | 39 | D |

Discovered with the 6-inch. The principal star has a proper motion of $0^\circ 026$ in the direction 247° (ATWERS).

(A. C. C. 8193. 500. 1880. 1882.) (A. C. C. 8193. 500. 1880. 1882.) (A. C. C. 8193. 500. 1880. 1882.)

β 1148. Groombridge 4070

R.A. $23^h 22^m 2^s$ $\left\{ \right.$
 Decl. $+ 64^{\circ} 58' \lambda$

| | | | | | |
|---------|------|------|------------|----------------|---------|
| 1889.60 | 73.9 | 2.13 | 7.1...13.0 | 3 ⁿ | β |
| 1898.68 | 77.3 | 2.47 | 6.5...13.0 | 1 ⁿ | A |

Discovered with the 36-inch. In D.M. 6.5 m.

[β (xvi)... β (2956)... β (*Pub. L. O. II*)...Aitken ()...]

 β 1221. D.M. (41) 4788

R.A. $23^h 22^m 12^s$ $\left\{ \right.$
 Decl. $+ 41^{\circ} 46' \lambda$

| | | | | | |
|---------|-------|------|------------|----------------|---------|
| 1890.50 | 145.2 | 1.91 | 9.3...10.5 | 3 ⁿ | β |
| 1896.93 | 145.9 | 1.73 | ... | 3 ⁿ | A |

Discovered with the 16-inch at the Warner Observatory in 1885.

[β (xviii)... β (3047)... β (*Pub. L. O. III*)...Aitken (3466)...]

 β 1222. D.M. (2ⁿ) 4669

R.A. $23^h 22^m 23^s$ $\left\{ \right.$
 Decl. $+ 2^{\circ} 54' \lambda$

| | | | | | |
|---------|------|------|-----------|----------------|---------|
| 1890.82 | 37.4 | 1.14 | 8.0...9.0 | 3 ⁿ | β |
| 1896.87 | 35.2 | 0.92 | ... | 4 ⁿ | A |
| 1898.74 | 31.8 | 1.04 | ... | 1 ⁿ | Bow |

Discovered with the 12-inch.

[β (xvii)... β (3047)... β (*Pub. L. O. III*)...Aitken (3466)...
 Bowser (*Mon. Not. LIX*, 400)...]

 β 1149. D.M. (57) 2746

R.A. $23^h 24^m 11^s$ $\left\{ \right.$
 Decl. $+ 58^{\circ} 41' \lambda$

| | | | | | |
|---------|-------|------|-----------|----------------|---------|
| 1889.58 | 309.1 | 0.52 | 9.4...9.8 | 3 ⁿ | β |
| 1898.81 | 308.9 | 0.56 | ... | 2 ⁿ | Hu |

Discovered with the 36-inch. In the field with the multiple star, O Σ 496.

O Σ 496 (A) and β 1149 (AB)

| | | | | | |
|------------------|----------------|----------------------------------|---------------|----------------|---------|
| 1889.58 | 277.6 | 231.07 | ... | 1 ⁿ | β |
| [β (xvi)] | β (2956) | β (<i>Pub. L. O. II</i>) | Husser ()... | | |

 β 1266. D.M. (32) 4963

R.A. $23^h 24^m 29^s$ $\left\{ \right.$
 Decl. $+ 30^{\circ} 10' \lambda$

A and B

| | | | | | | |
|---------|------|------|-----|-----|----------------|---------|
| 1891.69 | 74.0 | 0.24 | 7.4 | 7.4 | 3 ⁿ | β |
| 1893.54 | 65.9 | 0.23 | | | 1 ⁿ | Lv |
| 1893.64 | 73.3 | 0.26 | 8.0 | 8.0 | 2 ⁿ | W |
| 1893.67 | 60.3 | 0.22 | | | 7 ⁿ | Sp |
| 1895.96 | 55.5 | 0.20 | | | 2 ⁿ | Sp |
| 1896.78 | 52.0 | 0.28 | | | 2 ⁿ | Lew |
| 1897.94 | 41.6 | 0.36 | | | 1 ⁿ | Lew |
| 1898.71 | 54.0 | 0.35 | | | 1 ⁿ | Lew |
| 1899.55 | 45.5 | 0.24 | 7.7 | 7.8 | 3 ⁿ | A |

AB and C (Σ 3018)

| | | | | | | |
|---------|-------|-------|--------|-----|----------------|----------|
| 1830.52 | 204.0 | 18.92 | 7.2... | 9.5 | 2 ⁿ | Σ |
| 1843.74 | 203.4 | 19.41 | ... | ... | 1 ⁿ | M |
| 1864.45 | 204.0 | 18.98 | 7.2... | 9.0 | 3 ⁿ | J |
| 1870.07 | 203.8 | 18.83 | 7.9... | 9.8 | 4 ⁿ | Dun |
| 1879.57 | 202.9 | 19.19 | 7.0... | 9.5 | 1 ⁿ | Cin |
| 1891.69 | 203.5 | 18.92 | ... | 9.0 | 3 ⁿ | β |
| 1894.44 | 203.6 | 18.79 | ... | ... | 2 ⁿ | Sp |
| 1897.86 | 204.0 | 18.95 | ... | ... | 3 ⁿ | Lew |
| 1899.54 | 203.4 | 18.77 | ... | ... | 1 ⁿ | A |

The larger component of Σ 3018 was found to be a close pair with the 36-inch. The measures show rapid motion. It is a binary, and probably of short period. There is no change in C since the observations of STRUVE. All the measures are given.

[β (xviii)... β (3113)... β (*Pub. L. O. III*)...L.V. & L. (3829)...
 ...Sp (iii)...Wilson ()...Lewis (*Mon. Not. LIX*, 400)...
 ...Madler (*Fixstern-Systeme* I) (*Dorpat Obs.* XI)...
 Herschel (*Memo. R. A. S.* 1833)...J. III)...Duner (*Moscou*
Microm. Lund, 1876)...Cin5...Aitken ()...]

 β 1150. O. Arg. N. 25072

R.A. $23^h 24^m 46^s$ $\left\{ \right.$
 Decl. $+ 64^{\circ} 24' \lambda$

| | | | | | | |
|---------|------|------|-----|-----|----------------|---------|
| 1889.60 | 44.0 | 0.61 | 8.7 | 9.0 | 3 ⁿ | β |
| 1898.68 | 49.7 | 0.57 | 8.5 | 9.0 | 1 ⁿ | A |

Discovered with the 36-inch.

[β (xvi)] β (2956) β (*Pub. L. O. II*) Aitken ()...]

β 81. W. XIII. 562

| | RA | 23 ^h | 28 ^m | 57 ^s | <i>t</i> | |
|---------|------|-----------------|-----------------|-----------------|----------|-----|
| | Dec. | -12° | -11° | -3' | | |
| 1870.08 | 10.5 | 1.53 | 8.3 | 0.8 | 30 | J |
| 1877.89 | 14.8 | 1.09 | 8.2 | 0.7 | 20 | Cin |
| 1880.45 | 13.4 | 1.09 | 8.2 | 1.0 | 30 | LM |
| 1807.04 | 14.6 | 2.01 | ... | ... | 10 | B |

Discovered with the 6-inch. Probably fixed.

[S. I. B. *Moscow Univ. Math. J.*, XXXIII, 351, 1979] (M. Brown,)

β 721. W: XXIII. 592

| | R.A. 23 ^h 43 ^m 7 ^s 1 | |
|---------|---|----------------------------|
| | Decl. 7° 47' 5" | |
| 1878.22 | 138.2 | 0.51 9.0... 1.0 1H β |
| 1879.10 | 145.5 | 0.44 8.0... 9.0 2H Cin |
| 1886.77 | 134.6 | 0.38 8.0... 8.3 2H LM |
| 1898.68 | 117.1 | 0.73 8.0... 8.5 1H Bd |
| 1890.68 | 131.7 | 0.32 8.6... 8.6 3H A |

Discovered with the 18½-inch. The change, if any, is in the distance. There is a faint star in the $\pi \rho$ quadrant:

| | | | | | |
|---------|-------|-------|------|----|----|
| 1898.68 | 301.7 | 21.38 | 12.5 | 1H | Bd |
| 1899.63 | 301.1 | 22.19 | 14.0 | 1H | A |

[β (N) ... 3 Cms 1 M Boothroyd 1 Aitken

| [g (N) ... 3 | Chem | FM | Boothroyd | Aitken |
|--------------|------|-----|-----------|--------|
| 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |

β 775 = β 1012. Lacaille 9534

| | | R.A. 23 ^h 30 ^m 45 ^s .1 | | | |
|---------|-------|---|--------|------|-------------------------------|
| | | Decl. 32° 32' 3" | | | |
| 1881.45 | 251.0 | 5.35 | 7.2... | 10.5 | 4 ⁿ β |
| 1886.92 | 248.0 | 5.60 | 7.0... | 9.5 | 2 ⁿ Pol |
| 1898.70 | 251.2 | 5.28 | 7.0... | 11.0 | 3 ⁿ [Cg |
| 1898.74 | 250.6 | 5.28 | 7.0... | 10.0 | 3 ⁿ \overline{A} |

Discovered with the 6-inch at Mt. Hamilton in 1879, and again independently with the 12-inch in 1881. In Cord. G. C. 6½ m. Without change.

[*B*. (VI, VIII) . *B*² . *B*³ . Pollock (*Pub.* Science Club (Nal)
(*Mem.* R. A. S. I.) . Cogshall] | Almer (1883) |

β 855. D.M. 1000. 1000. 1000.

| | RA | Dec | 2000 | 2000 | 2000 | 2000 |
|---------|---------|---------|---------|---------|---------|---------|
| | [h:m:s] | [d:m:s] | [h:m:s] | [h:m:s] | [h:m:s] | [h:m:s] |
| 1851.53 | 204.2 | 182 | 8.5 | 8.8 | 46 | 3 |
| 1855.51 | 199.0 | 76 | 8.5 | 8.5 | 30 | Common |
| 1859.53 | 201.2 | 74 | 8.5 | 8.2 | 30 | 10 |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)... β^4 ...Comstock (*Pub. Washburn Obsy.*, v1)...Doo-
little (*Pub. Flower Obsy.*, 1)...]

β 722. 10 N. 61. 1488

| | | K X 25 32 34 4 | | | | | |
|---------|-------|----------------|-----|------|----|-------------|--|
| | | 16 1 21 51 3 | | | | | |
| 1878.53 | 348.9 | 7.45 | 6.8 | 12.5 | 19 | β | |
| 1885.82 | 348.5 | 7.38 | | | 29 | $\Pi\Sigma$ | |
| 1897.82 | 348.9 | 7.26 | ... | | 29 | β | |

Discovered with the 18½-inch. Without change.

$$[\beta(X)] = 5 \quad \text{H}\Sigma$$

β 856. O. Arg. N. 2885.

| | | RA | Dec | z | σ | | |
|---------|-------|------|--------|-----|----------|-----|--|
| | | 23 | 33 | 3 | 1 | | |
| | | Dec | + | 00 | 58 | 3 | |
| 1881.55 | 200.0 | 0.55 | 8.1 | 1.1 | 2M | B | |
| 1886.89 | 267.8 | 0.66 | 8.2... | 9.5 | 3N | Com | |
| 1898.53 | 205.8 | 0.02 | 8.5 | 0.3 | 2W | D | |

Discovered with the 15½-inch at the Washburn Observatory.

little (*Pub. Flower Obsy.* 1) . . .]

β 723. Lalande 19375

| | | R.A. 23 34 ^m 32 ^s / Dec. 8 18 5 | | | |
|---------|-------|---|-----|------|------|
| 1878.25 | 168.5 | 3.78 | 7.0 | 11.3 | 12.0 |
| 1888.13 | 168.2 | | 7.2 | 12.2 | 16.1 |
| 1891.77 | 167.8 | 3.69 | 7.1 | 11.5 | 32.0 |

Discovered with the 18½-inch. Fixed.

$$|f(x) - S| = |f(x) - f(x_0)| = S(P_{x_0} - f(x_0)) = 1 - x_0 = 1 - x.$$

β 993. *Cephei* 301

R.A. $23^h 36^m 42^s$ $\frac{1}{2}$
Decl. $+ 63^\circ 51'$

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1880.75 | 279.7 | 2.67 | 7.0 | 11.4 | 4 ⁿ | β |
| 1892.73 | 277.4 | 2.79 | 7.0 | 12.0 | 1 ⁿ | W |
| 1898.66 | 274.0 | 2.48 | 7.0 | 11.0 | 3 ⁿ | D |

Discovered with the 18½-inch. Magnitude in Argelander 6.0; Harvard 6.9; A.G.C. 6.5. Groombridge 4130.

[β (XIII) ... β ... Wilson () ... Doolittle (*Pub. Flower Obs.* 1901)]

 β 994. *Lalande* 46490

R.A. $23^h 37^m 31^s$ $\frac{1}{2}$
Decl. $+ 24^\circ 26'$

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1880.63 | 306.5 | 1.38 | 7.0 | 11.0 | 4 ⁿ | β |
| 1893.77 | 315.1 | 1.45 | 8.0 | 10.8 | 3 ⁿ | W |

Discovered with the 18½-inch.

[β (XIII) ... β ... Wilson () ...]

 β 1223. *D.M.* (4) 5046

R.A. $23^h 39^m 10^s$ $\frac{1}{2}$
Decl. $+ 4^\circ 27'$

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1890.82 | 298.6 | 1.33 | 8.1 | 10.8 | 3 ⁿ | β |
| 1892.46 | 297.2 | 1.32 | ... | ... | 4 ⁿ | Sp |
| 1896.88 | 291.2 | 1.16 | ... | ... | 2 ⁿ | A |
| 1897.96 | 294.8 | 1.19 | ... | ... | 1 ⁿ | Lew |

Discovered with the 12-inch. Change in angle?

[β (XVII) ... β 13047 ... β 1796 ... β (O. III) ... Aitken (1306 Sp. III) ... Lewis (*Mem. Acad. Sci.* 1891) ...]

 β 726. *S.D.* (13) 61601

R.A. $23^h 40^m 24^s$ $\frac{1}{2}$
Decl. $+ 13^\circ 25'$

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1877.86 | 324.2 | 0.91 | 8.5 | 10.5 | 1 ⁿ | β |
| 1879.77 | 326.6 | ... | 8.0 | 10.2 | 2 ⁿ | Cin |
| 1886.85 | 324.5 | 0.68 | 8.1 | 10.2 | 2 ⁿ | I M |
| 1898.76 | 326.3 | 0.89 | 8.5 | 10.5 | 1 ⁿ | Bd |
| 1898.86 | 320.2 | 0.67 | 8.0 | 10.0 | 2 ⁿ | A |
| 1898.72 | 322.5 | 0.65 | 8.5 | 10.5 | 3 ⁿ | Hu |

Discovered with the 18½-inch.

[β (X) ... β ... Cin ... LM ... Boothroyd () ... Aitken (1884) ... Hussey () ...]

 β 727. *W. XXIII* 8606

R.A. $23^h 41^m 20^s$ $\frac{1}{2}$
Decl. $+ 24^\circ 35'$

| | | | | | | |
|---------|-------|-------|-----|------|----------------|------------|
| 1878.09 | 313.4 | 17.47 | 7.0 | 12.5 | 2 ⁿ | β |
| 1885.82 | 313.6 | 16.86 | ... | ... | 2 ⁿ | H Σ |
| 1891.64 | 315.2 | 16.83 | 7.3 | 13.5 | 3 ⁿ | β |
| 1899.72 | 316.2 | 17.08 | 7.0 | 11.8 | 2 ⁿ | D |

Discovered with the 18½-inch. The distance printed in β (X) should be doubled.

[β (X) ... β ... β (3114) ... β ... β ... H Σ ... Doolittle (*Pub. Flower Obs.* 1901) ...]

 β 390. *Lalande* 46617

R.A. $23^h 41^m 33^s$ $\frac{1}{2}$
Decl. $+ 48^\circ 38'$

| | | | | | | |
|---------|-------|-------|-----|------|----------------|---------|
| 1870.59 | 233.0 | 18.35 | 8.1 | 12.0 | 1 ⁿ | Cin |
| 1880.74 | 233.9 | 18.02 | 8.3 | 11.8 | 1 ⁿ | β |
| 1892.84 | 233.3 | 17.28 | 8.2 | 11.2 | 2 ⁿ | W |
| 1899.68 | 232.2 | 17.58 | 7.6 | 11.2 | 2 ⁿ | D |

Discovered with the 6 inch. Change in distance?

[β (VI) ... β 12002 ... β ... Wilson () ... Doolittle (*Pub. Flower Obs.* 1901) ...]

 β 995. *Groombridge* 4130

R.A. $23^h 41^m 33^s$ $\frac{1}{2}$
Decl. $+ 48^\circ 38'$

| | | | | | | |
|---------|-------|------|-----|------|----------------|---------|
| 1879.01 | 240.0 | 0.73 | 6.0 | 9.0 | 1 ⁿ | Cin |
| 1880.01 | 245.4 | 0.88 | 6.5 | ... | 2 ⁿ | β |
| 1889.48 | 243.4 | 0.93 | 6.2 | 10.2 | 3 ⁿ | β |
| 1891.75 | 239.8 | 0.77 | 6.7 | 9.5 | 3 ⁿ | β |
| 1894.03 | 238.4 | 0.73 | ... | ... | 3 ⁿ | Sp |
| 1898.65 | 237.5 | 0.81 | 6.2 | 8.4 | 4 ⁿ | A |

Discovered with the 18½-inch. This is a naked eye star in *Andromeda*. Change in angle is probable.

[β (XVIII) ... β ... β 2087, 3174 ... β ... Aitken (1884) ...]

152

A and B:

 β 1013. δ

| | | | | | |
|---------|-------|------|----------------|----|---|
| 1801-50 | 225.2 | | 5.0 . . . 13.0 | 25 | B |
| 1801-50 | 225.0 | 3.34 | 4.7 . . . 10.0 | 25 | B |
| 1801-05 | 220.0 | | 5.5 . . . 10.0 | 25 | A |

| | | | | | | |
|----------|-------|-------|---|-----|-----|---|
| 1835 | 300.0 | 74.7 | 5 | ... | ... | 1 |
| 1841-88 | 296.6 | 74.31 | | 8.9 | 37 | 3 |
| 1889-64 | 296.7 | 74.31 | | 8.8 | 20 | 3 |
| 1895-... | 296.7 | 74.23 | | ... | 26 | 1 |

The close star was discovered with the 12-inch on Mt. Hamilton in 1881. ACWERS gives the proper motion of δ Sculptoris 0.108 in the direction of 154° . The close star is moving with the other, and it is doubtless a physical system. All the measures of the Herschel star are given above. His estimate of the distance in 1830 must be too large. The three sets of measures seem to indicate common proper motion, as otherwise the distance should have increased about $1\frac{1}{2}$ from 1881 to 1898.

875.

Discovered with the 18½-inch. In A.G.C. 7.1 m

[$\beta^1(X)$, . . . , $\beta^r(X)$, Engelmann (2678), . . . Wilson (2679)]

β 000. P. 111 111 111

| | | | |
|-------|-------|-------|-------|
| 1. A | 2. B | 3. C | 4. D |
| 10. E | 11. F | 12. G | 13. H |

| | | | | | | |
|---------|-----|------|-----|------|----|---------|
| 1888.64 | 0.4 | 8.82 | 0.8 | 1.07 | 49 | β |
| 1888.74 | 0.7 | 8.43 | 7.2 | 12.0 | 39 | β |
| 1889.51 | 0.8 | 8.7 | 6.4 | 10.8 | 39 | β |
| 1889.02 | 7.9 | 5.72 | 6.5 | 11.4 | 29 | β |

Discovered with the 152 $\frac{1}{2}$ inch. The large star has a considerable proper motion, 0.288 in the direction of 81.8 (PORTER). This is evidently a binary in slow direct angular motion, with a large movement in space common to both components.

ENGELHARDT (10699) *Astron.* (11) measures a distant star, D.M. (74°) $1049, 130^{\circ}.6 : 165^{\circ}.74$ (1894.11) 27.

[*d* = 0.0] [*d* = 0.2878, 0.4571] [*d*(*P*₉₀) = 0.0] [*d*(*P*₉₀) = 0.0]

β 850. W² XXIII. 964

| | | |
|------|----|------|
| ReA | 25 | 16.5 |
| Devl | 22 | 18 |

| | | | | | | |
|---------|-------|-----|-----|------|------------|---------|
| 1884.97 | 217.3 | 163 | 8.5 | 8.5 | 3 <i>n</i> | β |
| 1887.81 | 214.8 | 164 | 9.9 | 10.2 | 3 <i>n</i> | Com |
| 1892.74 | 215.8 | 172 | 9.9 | 10.0 | 2 <i>n</i> | D |

Discovered with the 15½ inch at the Washburn Observatory.

[3] . . . [3] (omitted) (*Pub. Flower Obs.*, vi) . . . [3]
little (*Pub. Flower Obs.*, i) . . .]

β 1153.

R.A. 23^h 46^m 45^s
 Decl. +60° 2'

Answer 15:

| | | | | | | |
|---------|-------|------|-----|------|----|---------|
| 138.765 | 318.5 | 0.13 | 0.7 | 0.9 | 40 | β |
| 139.955 | 318.6 | 0.43 | 0.7 | 10.2 | 20 | A |

AB and C

| | | | | | |
|---------|-------|-------|------|----|---|
| 1889.68 | 339.5 | 137.2 | 10.1 | 3n | B |
| 1889.87 | 330.6 | 137.1 | 10.0 | 2n | A |

AB and OS 511 (A)

1889.60 66.0 176.51 ... 6.8 2*n* β

A very difficult pair of small stars, discovered with the 36-inch. Too faint to be given in the D.M. I have connected it with another pair in the field, OS 511.

[β (XVII)... β (2050)... β (Pub. L. O. II)...Aitken (...)]

 β 729. O. Arg. S. 23124

R.A. 23^h 40^m 14^s $\frac{1}{2}$
Decl. + 8° 30' $\frac{1}{2}$

1877.70 346.4 11.42 8.0...12.0 1*n* β
1891.89 344.9 11.22 8.0...12.7 2*n* β
1898.85 344.9 11.47 8.0...11.2 2*n* β

Discovered with the 18½-inch. Without change. The magnitude in O. Arg. is 7.0.

[β (X)... β ... β (3114)... β (Pub. L. O. III)...]

 β 1224. Lalande 46912

R.A. 23^h 50^m 5^s $\frac{1}{2}$
Decl. + 55° 10' $\frac{1}{2}$

1890.74 293.3 3.94 6.6...13.3 3*n* β
1899.63 291.4 4.10 6.5...13.8 3*n* A

Discovered with the 36-inch. In D.M. 7.5 m. Piazzzi XXIII. 236.

[β (XVII)... β (3047)... β (Pub. L. O. II)...Aitken (...)]

 β 280. D.M. (56) 3120

R.A. 23^h 51^m 50^s $\frac{1}{2}$
Decl. + 50° 43' $\frac{1}{2}$

A and C

1880.74 185.9 8.08 12.5 1*n* β
1886.90 193.2 8.27 ... 2*n* III
1891.80 189.8 7.90 ...12.2 2*n* β
1898.61 186.2 8.24 ...13.6 2*n* D

A and B (Σ 3017)

1832.20 65.6 1.18 8.7... 8.7 3*n* Σ
1890.68 67.5 1.02 8.7 ... 4*n* J

1880.74 77.3 6.89 1*n* β
1891.80 74.1 6.92 8.1 8.1 2*n* β
1898.61 74.1 1.14 8.2 8.2 2*n* D

The small star was discovered with the 9.4-inch of the Dartmouth College Observatory. The close pair is probably a binary, but the motion is very slow. The relation of the third star to the system is still uncertain.

[β (X)... β (L. O. V)... β (XVI)... β (3114)... β (L. O. II)...Hall (II)...Doolittle (Pub. Flower Obs., I)...]

The measures given of AB, and others, will be found in the following additional references:

[Muller (*Fixed-star Systems*, II) (*Unspat. Beob.*, XI, VII, XV)...Herschel (*Mem. R. A. S.* IV)...Secchi (*Catalogo di 1321 Stelle Doppie*)...OZ (*Poulkova Obs.*, IX)...Gledhill, Wilson and Seabrooke (*Mem. R. A. S.* XLII, J. II)...Gleason (*Obs.*, (III)...]

 β 730. 27 Piscium

R.A. 23^h 52^m 32^s $\frac{1}{2}$
Decl. + 13° 13' $\frac{1}{2}$

1878.39 265.8 1.42 5.5...10.8 3*n* β
1879.03 264.0 1.40 4.9... 9.5 3*n* Cn
1879.84 264.4 1.60 5.5...11.2 2*n* β
1886.88 269.1 1.78 5.0... 6.6 2*n* L.M.
1889.57 267.4 1.50 5.0...11.3 3*n* β
1898.66 272.8 1.66 6.0...11.7 3*n* Cg

Discovered with the 18½-inch. Certainly a physical system, since the components have a common proper motion of $\alpha^{\circ}094$ in the direction of 232°7 (AUWERS). There is very little relative change.

[β (X)... β ... β (2157)... β (L. O. V)... β (L. O. II)...Coggshall (...)]

 β 1154. D.M. (73) 1008

R.A. 23^h 53^m 12^s $\frac{1}{2}$
Decl. + 74° 10' $\frac{1}{2}$

1889.51 310.1 6.98 8.0 8.2 3*n* β
1892.87 129.7 8.61 8.0... 8.2 2*n* J
1895.90 308.0 6.77 8.1 8.1 3*n* A
1896.93 309.4 6.88 3*n* A

Discovered with the 6-inch. No material change.

See also the following Catalogues of Double Stars:
Revised Cat. Obs. (1822)... Attkin (1490, 1460, ...)

 β 731. *Antares* γ .

R.A. 16^h 52^m 42^s
 Decl. + 8° 38' 3"

| 1878.72 | 187.2 | 0.57 | ... | 20 | β |
|---------|-------|------|-----|-----|---------|
| 1880.74 | 105.4 | 0.7 | ... | 3 | 40 |
| 1882.76 | 105.4 | 0.30 | ... | 20 | 1A |
| 1884.78 | 105.4 | 1.49 | ... | 27 | 30 |
| 1898.72 | 265.8 | 1.60 | 8.5 | 9.2 | 30 |

Discovered with the 18½-inch. Some motion in α -component possible.

[β (M)... β ... L.M. ... L.v. ... Attkin (1585) ... Cogshall (1...)]

 β 860. *Antares* γ .

R.A. 20^h 52^m 42^s
 Decl. + 8° 38' 12"

| 1881.72 | 107.2 | 0.70 | ... | 11.00 | 40 | β |
|---------|-------|------|-----|-------|------|---------|
| 1881.83 | 105.4 | 0.12 | 6.5 | ... | 11.0 | 20 |
| 1885.82 | 107.9 | 6.66 | ... | ... | ... | 20 |
| 1894.81 | 106.4 | 6.85 | 6.3 | ... | 11.9 | 10 |
| 1898.81 | 106.7 | 6.91 | 6.3 | ... | 11.9 | 20 |

Discovered with the 15½-inch at the Washburn Observatory. Lalande 47049.

[β (M)... β ... Hough (2978) ... Comstock (*Pub. Washburn Obs.* vi)... H2 (1... Doolittle (*Pub. Flower*...))

 β 732. *Antares* γ .

R.A. 16^h 52^m 42^s
 Decl. + 8° 38' 3"

| 1881.72 | 107.2 | 0.70 | ... | 11.00 | 40 | β |
|---------|-------|------|-----|-------|------|---------|
| 1891.87 | 102.9 | 5.95 | 8.5 | ... | 9.5 | 20 |
| 1893.87 | 101.8 | 5.84 | 8.8 | ... | 10.3 | 30 |
| 1898.84 | 101.7 | 5.95 | 8.5 | ... | 10.7 | 10 |

Discovered with the 18½-inch. Without change.

[β (M)... β ... Hough (2978) ... Comstock (*Pub. Washburn Obs.* vi)... H2 (1... Doolittle (*Pub. Flower*...))

 β 482. *Antares* γ .

R.A. 23^h 58^m 45^s
 Decl. + 62° 30' 3"

A and B

| | | | | | | |
|---------|-------|------|------|------|----|---------|
| 1877.23 | 342.6 | 4.07 | 9.7 | 11.0 | 20 | J |
| 1880.74 | 341.6 | 4.28 | 9.5 | 9.8 | 10 | β |
| 1888.71 | 343.8 | 4.60 | 9.00 | 10.0 | 30 | β |
| 1898.56 | 343.0 | 4.75 | 9.0 | 9.5 | 20 | D |

A and C

| | | | | | |
|---------|-------|------|------|----|---------|
| 1880.74 | 125.9 | 9.46 | 11.8 | 10 | β |
| 1888.71 | 123.9 | 9.79 | 11.2 | 30 | β |
| 1898.56 | 122.9 | 9.90 | 10.8 | 20 | D |

Discovered with the 6-inch. No material change. In D.M. 8.9 m.

[β (M)... β ... *Mon. A.C.* XXXVIII, 78)... β ... β (2875)
 β (196... β ... 11... β ... Doolittle (*Pub. Flower Obs.* 1)...]

 β 733. *Antares* γ .

R.A. 23^h 58^m 45^s
 Decl. + 62° 27' 3"

A and B

| | | | | | | |
|---------|-------|------|------|------|---------|---------|
| 1878.73 | 274.0 | 0.67 | 6.0 | 12.5 | 30 | β |
| 1879.46 | 284.6 | 0.75 | 11.3 | 50 | β | |
| 1880.59 | 298.3 | 0.65 | 10.5 | 50 | β | |
| 1880.79 | 297.2 | 0.66 | | 30 | 111 | |
| 1881.54 | 311.5 | 0.58 | 11.0 | 10 | β | |
| 1882.62 | 89.4 | 0.64 | 9.0 | 10 | β | |
| 1883.75 | 333± | | | | β | |
| 1885.93 | 107.0 | 0.5± | | | 11 | |

| | | | | |
|---------|-------|------|-----------------|-------------------------|
| 1892.88 | 165.4 | 0.73 | 1 ⁿ | Bar |
| 1892.97 | 167.3 | 0.73 | 1 ⁿ | Sp |
| 1893.64 | 168.3 | 0.90 | 2 ⁿ | Schae |
| 1893.92 | 174.0 | 0.88 | 3 ⁿ | Bar |
| 1893.96 | 176.1 | 0.69 | 6 ⁿ | Sp |
| 1894.53 | 178.6 | 0.84 | 5 ⁿ | Bar |
| 1894.59 | 181.3 | 0.89 | 4 ⁿ | Schae |
| 1894.93 | 188.6 | 0.65 | 2 ⁿ | Sp |
| 1894.98 | 177.6 | 0.65 | 6.0 | 11.0 2 ⁿ Lew |
| 1895.53 | 191.2 | 1.02 | 4 ⁿ | Schae |
| 1895.64 | 190.5 | 0.83 | 10 ⁿ | Bar |
| 1895.71 | 185.8 | 0.86 | 5.5 | 11.8 6 ⁿ A |
| 1895.73 | 198.4 | 0.73 | 2 ⁿ | See |
| 1895.74 | 204.8 | 0.7± | 1 ⁿ | Moul
ton |
| 1895.86 | 196.3 | 0.47 | 2 ⁿ | Lew |
| 1896.04 | 201.6 | 0.73 | 6 ⁿ | Sp |
| 1896.75 | 200.8 | 0.54 | 3 ⁿ | A |
| 1896.81 | 205.5 | 0.76 | 3 ⁿ | Schae |
| 1896.86 | 208.6 | 0.60 | 2 ⁿ | Hussey |
| 1897.59 | 212.5 | 0.79 | 8 ⁿ | Schae |
| 1897.70 | 207.5 | 0.89 | 1 ⁿ | Dob |
| 1897.72 | 209.9 | 0.70 | 3 ⁿ | A |
| 1897.74 | 226.3 | 0.83 | 1 ⁿ | Doo |
| 1897.75 | 209.9 | 0.74 | 4 ⁿ | Hussey |
| 1897.96 | 218.0 | 0.61 | 3 ⁿ | Sp |
| 1897.97 | 216.1 | 0.76 | 1 ⁿ | Lew |
| 1898.44 | 217.5 | 0.79 | 3 ⁿ | A |
| 1898.80 | 225.5 | 0.59 | 2 ⁿ | Lew |
| 1898.89 | 224.8 | 0.5 | 1 ⁿ | Doo |
| 1898.94 | 225.8 | 0.67 | 3 ⁿ | Sp |
| 1899.51 | 225.6 | 0.78 | 0.0 | 11.1 4 ⁿ A |

A and C

| | | | | | |
|---------|-------|-------|-----|--------------------|------------------|
| 1851.96 | 114.1 | 33.03 | 6.0 | 8.5 1 ⁿ | O2 |
| 1852.67 | 113.9 | 32.60 | | 1 ⁿ | O2 |
| 1865.91 | 92.1 | 18.89 | | 1 ⁿ | O2 |
| 1868.77 | 82.4 | 17.03 | | 1 ⁿ | O2 |
| 1869.98 | 77.8 | 16.13 | | 20 ⁿ | Bru |
| 1870.65 | 74.4 | 15.47 | | 25 ⁿ | Bru |
| 1874.66 | 54.4 | 13.92 | | 1 ⁿ | O2 |
| 1876.77 | 40.3 | 14.02 | | 1 ⁿ | O2 |
| 1877.94 | 30.8 | 14.0 | | 1 ⁿ | Bin |
| 1878.54 | 33.0 | 14.40 | | 1.0 | 4 ⁿ B |
| 1878.74 | 32.8 | 14.76 | | 1.0 | 1 ⁿ J |
| 1879.27 | 39.4 | 14.90 | | 1.0 | 8 ⁿ B |
| 1880.57 | 25.0 | 15.41 | | 1 ⁿ | B |
| 1881.54 | 20.8 | 16.29 | | 4 ⁿ | B |
| 1881.88 | 19.8 | 16.54 | | 1 ⁿ | B |
| 1882.62 | 18.2 | 16.98 | | 1 ⁿ | O2 |

| | | | | | |
|---------|-------|-------|-----|----------------|------|
| 1882.77 | 17.1 | 17.34 | | 3 ⁿ | B |
| 1883.54 | 11.3 | 17.34 | | 1 ⁿ | Seag |
| 1886.24 | 7.6 | 19.84 | | 3 ⁿ | H2 |
| 1886.99 | 6.1 | 21.15 | | 3 ⁿ | Eng |
| 1888.67 | 0.9 | 21.71 | | 5 ⁿ | B |
| 1889.50 | 358.7 | 22.66 | 0.0 | 4 ⁿ | B |
| 1889.82 | 358.4 | 22.70 | | 2 ⁿ | Lv |
| 1890.52 | 356.7 | 23.59 | | 3 ⁿ | B |
| 1891.56 | 354.7 | 24.58 | | 3 ⁿ | B |
| 1891.94 | 354.3 | 25.02 | | 8 ⁿ | B |
| 1895.06 | 350.0 | 28.86 | | 1 ⁿ | Lew |
| 1895.68 | 348.7 | 29.27 | 8.8 | 3 ⁿ | A |
| 1896.75 | 347.8 | 30.48 | | 2 ⁿ | A |
| 1897.56 | 346.1 | 31.49 | | 2 ⁿ | A |
| 1897.82 | 345.7 | 31.74 | | 2 ⁿ | B |
| 1898.49 | 344.4 | 32.53 | | 3 ⁿ | B |
| 1898.69 | 344.5 | 32.90 | | 2 ⁿ | A |

A and D

| | | | | | |
|---------|-------|-------|------|----------------|---|
| 1878.96 | 277.1 | 61.73 | 13 | 1 ⁿ | B |
| 1880.56 | 278.0 | 64.25 | 12.5 | 1 ⁿ | B |
| 1888.69 | 283.8 | 72.02 | 12 | 1 ⁿ | B |
| 1891.90 | 285.4 | 75.09 | 13.2 | 4 ⁿ | B |
| 1897.56 | 288.0 | 81.89 | | 2 ⁿ | A |
| 1897.82 | 288.0 | 82.54 | | 2 ⁿ | B |
| 1898.47 | 288.4 | 83.29 | | 2 ⁿ | B |
| 1898.69 | 288.5 | 83.86 | 13.0 | 2 ⁿ | A |

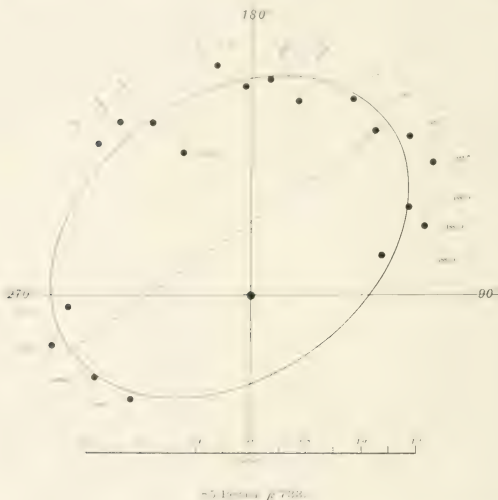
One of the most important and most interesting of the known binary systems. The shortness of its period, the rapid movement in space of both components, the relative nearness of this system to our own, and the extreme inequality in magnitude and closeness of the stars, all combine to give this a leading place among the binary stars. It is at all times an object of considerable difficulty, and the reliable observations will necessarily be confined to the larger refractors. It is an excellent test for the definition of any object glass, however large, and no instrument, whatever its aperture, can deal with a pair of this class unless the figure of the objective will compare favorably with the Alvan Clark standard.

The close companion was discovered with the 18½-inch of the Dearborn Observatory while measuring the 9^m optical companion. The distant companion had been measured on two nights before the close star was detected. The third night was perhaps of unusual steadiness, as, in addition to 85 *Polaris*, four other first-class stars were discovered

Four orbits have been computed of this pair. The dates of the last measures made use of, and the periods are:

The principal results, including some from meridian observations, are:

| | | | |
|------------|-------|----|-------|
| Argelander | 1.308 | 01 | 135.0 |
| Madler | 1.370 | " | 133.0 |
| Brunnow | 1.259 | " | 133.0 |
| Schaeberle | 1.305 | " | 140.3 |
| Gore | 1.224 | " | 141.2 |
| O. Struve | 1.289 | " | 130.2 |
| Burnham | 1.280 | " | 130.5 |
| Anwers | 1.288 | " | 130.5 |
| Porter | 1.287 | " | 138.0 |



the elements of the several orbits are :

The last orbit is shown in the accompanying dia-

A comparison of the measures of D of 1878.26 with those of 1897.8 gives 1.30 in 136th for the movement of A. This is a very faint star, and the close agreement with the other results is sufficient to show that C has no proper motion of its own. A similar comparison of the two measures of C by Ω in 1851.2 with the two sets of measures in 1898 gives 1.281 in 139.2. It is worthy of note that the distances of C at these points, separated by an interval of forty-six years, differ by only one tenth of a second of arc.

λ 3.000 β 3.000 β 3.000 β 3.023 1963 3.042 875.229 57.304 8.311 41
 λ *Prob. I* C 410 β C 417 2401 Hall 410 α O 5
 λ *Prob. I* C 410 β C 417 2401 Hall 410 α O 5
 λ *Prob. I* C 410 β C 417 2401 Hall 410 α O 5

(*A. J.* 447)...Schachler (*A. J.* 185,246,323,391,420)...
Duberck (3466)...Lewis (*Greenwich Obs.* 1891, 1895)
(*Mon. Not. Lvi*, 359; *Lix*, 400)...Aitken (3466,3585)
(*Ant. Soc. Pac.* vii, 395) (*A. J.* 429)...Hussey (*A. J.* 397,
427)...Doddle (*A. J.* 416)...Aitken ()]

The following relate to the distant star C:

[Brunnow (*Dunank Obs.*, Part 2) (*Uvert. des Astron.
Gell.* ix, 38)...Argelander (*Beob. Sternwarte du Bonn* vi)
...Flammarion (*Etoiles Doubles et Multiples*) (*Sid. Mess.* iii,
213) (*L'Astronomie* iii, 176)...Engelhardt (*Obsns. Astron.* ii)
...Bigourdan (*Paris Obsns.* 1883)...Seagrave (*Sid. Mess.* ii,
288)...J (ii)...Gore (*Mon. Not. LIX*, 361)...Lv (*A. J.* 382)
(*Proc. Haverford Coll. Obs.* 1891) Comstock (*Pub. Washburn
Obs.* x)...Glasenapp (3145)...H2 ()...Everett (*Mon.
Not. Lvi*, 464)...See (3339) (*A. J.* 359,378) (*Evolution of
Binary System*)...]

β 281. Lalande 47148

R.A. 23^h 56^m 38^s $\frac{1}{2}$
Decl. + 1° 28' $\frac{1}{2}$

A and B

| | | | | | | |
|---------|-------|------|-----|------|----|-----|
| 1877.82 | 217.0 | 1.12 | 7.5 | 11.0 | 2n | β |
| 1881.73 | 212.6 | 1.25 | 7.5 | 9.2 | 2n | β |
| 1885.97 | 203.7 | 1.20 | | | 1n | H2 |
| 1888.89 | 209.0 | 1.35 | 8.0 | 9.3 | 1n | LV |
| 1891.61 | 208.8 | 1.25 | 7.9 | 10.2 | 3n | β |
| 1893.46 | 207.9 | 1.06 | | | 6n | Sp |
| 1897.96 | 203.3 | 1.53 | | | 1n | Lew |
| 1898.73 | 203.2 | 1.53 | 7.2 | 10.0 | 3n | A |
| 1898.85 | 199.8 | 1.38 | 7.3 | 9.8 | 4n | β |

A and C (= H 998)

| | | | | | | |
|---------|-------|-------|---|------|----|----|
| 1825 | 330± | 25± | 8 | 13 | 1n | H |
| 1877.82 | 335.8 | 30.44 | | 11.0 | 2n | β |
| 1881.73 | 336.7 | 30.85 | | 11.2 | 2n | β |
| 1885.97 | 334.3 | 31.20 | | | 1n | H2 |
| 1891.61 | 334.6 | 31.82 | | 11.9 | 3n | β |
| 1898.70 | 334.4 | 32.24 | | 12.0 | 2n | A |
| 1898.86 | 334.4 | 32.03 | | 10.8 | 3n | β |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The binary character of the close pair is established by the measures. The motion is retrograde, with perhaps a slow increase in the distance. The system has a proper motion of 0.079 in the direction of 154° 1 (Boss). This movement is in a direction opposite the HERSCHEL companion, and the distance of that star is therefore increasing annually by the proper motion of AB. At one time these stars must have formed a close pair.

[β (vi)...β (*Mon. Not. XXX*, 31)...β³ β³ (3311) β³ (*Pub. L. O.* ii)...Sp (iii)...Lewis (*Mon. Not. LIX*, 400)
...Aitken (3585)...H2 ()...]

β 861. D.M. 1127 11422

R.A. 23^h 56^m 38^s $\frac{1}{2}$
Decl. + 1° 28' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|-----|-----|----|-----|
| 1881.53 | 177.4 | 1.30 | 9.4 | 9.7 | 1n | β |
| 1887.80 | 177.8 | 1.78 | 9.3 | 9.5 | 2n | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β⁴...Comstock (*Pub. Washburn Obs.* vi)...]

β 862. W+XXIII. 1245

R.A. 23^h 58^m 38^s $\frac{1}{2}$
Decl. + 47° 30' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|-----|-----|----|-----|
| 1881.74 | 104.9 | 0.54 | 8.5 | 8.8 | 2n | β |
| 1888.32 | 107.5 | 0.55 | 8.5 | 9.0 | 2n | Com |
| 1899.57 | 115.5 | 0.50 | 8.7 | 9.1 | 3n | A |

Discovered with the 15½-inch at the Washburn Observatory. Apparently slow motion in angle.

[β (XII)...β⁴...Comstock (*Pub. Washburn Obs.* vi)...Aitken ()...]

β 997. Lalande 47213

R.A. 23^h 58^m 47^s $\frac{1}{2}$
Decl. + 45° 1' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|-----|-----|----|-----|
| 1879.80 | 340.2 | 4.25 | 9.1 | 10 | 2n | H1 |
| 1880.73 | 339.7 | 4.02 | 7.0 | 8.9 | 4n | β |
| 1885.76 | 340.8 | 4.08 | | | 3n | H1 |
| 1891.72 | 340.7 | 4.29 | 8 | 8 | 2n | H1 |
| 1895.69 | 339.8 | 4.12 | 7.0 | 9.1 | 3n | A |
| 1895.84 | 338.0 | 4.09 | | | 1n | Com |
| 1898.75 | 338.9 | 4.22 | | | 3n | H1 |

Discovered with the 18½-inch. Probably no motion. The last measures of HALL are erroneously credited to O2 547, which is in the field 8' n and 26' f.

[β (XIII) β³ H11 1.5 Aitken (*Pub. Washburn Obs.* vi, 243)
Comstock (*Pub. Washburn Obs.* 8) Hussey ()...]

β 863. D.M. 1127 1113

R.A. 23^h 59^m 42^s $\frac{1}{2}$
Decl. + 72° 55' $\frac{1}{2}$

| | | | | | | |
|---------|-------|------|-----|------|----|-----|
| 1881.57 | 123.7 | 1.00 | 9.2 | 11.6 | 3n | β |
| 1888.02 | 121.6 | 1.08 | 8.8 | 10.2 | 4n | Com |
| 1898.68 | 119.3 | 2.03 | 9 | 10.5 | 3n | A |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII) β³ Comstock (*Pub. Washburn Obs.* vi)...
Aitken (3585)...]

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| 489 | 04 33 40 | 124 | 492 | 00 38 27 | 10 | 523 | 2 41 55 | 33 |
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| 472 | 00 33 3 | 113 | 502 | 1 2 13 | 16 | 533 | 3 28 9 | 40 |
| 473 | 03 1 33 | 113 | 503 | 1 10 54 | 16 | 534 | 3 33 1 | 41 |
| 474 | 00 1 2 | 113 | 504 | 1 11 9 | 16 | 535 | 3 36 47 | 41 |
| 475 | 00 1 14 | 114 | 505 | 1 18 1 | 20 | 536 | 3 39 8 | 42 |
| 476 | 00 1 11 | 112 | 506 | 1 25 4 | 22 | 537 | 3 39 54 | 42 |
| 477 | 00 10 30 | 111 | 507 | 1 26 18 | 22 | 538 | 3 40 51 | 42 |
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| 479 | 00 20 33 | 117 | 509 | 1 37 25 | 24 | 540 | 3 48 21 | 44 |
| 480 | 00 13 33 | 110 | 510 | 1 43 4 | 25 | 541 | 3 48 53 | 44 |
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| 483 | 1 1 30 | 1 | 514 | 1 53 17 | 28 | 545 | 3 59 24 | 45 |
| 484 | 1 1 34 | 1 | 515 | 1 53 23 | 28 | 546 | 4 3 12 | 46 |
| 485 | 1 1 39 | 1 | 516 | 1 49 19 | 23 | 547 | 4 7 25 | 46 |
| 486 | 1 1 38 | 1 | 517 | 2 18 54 | 30 | 548 | 4 19 38 | 47 |
| 487 | 0 13 30 | 1 | 518 | 3 23 11 | 39 | 549 | 1 21 2 | 49 |

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| 550 | 4 ^h 20 ^m 2 ^s | 49 | 582 | 7 ^h 58 ^m 6 ^s | 96 | 614 | 13 ^h 48 ^m 2 ^s | 130 |
| 551 | 4 42 52 | 53 | 583 | 8 3 18 | 97 | 615 | 14 17 52 | 134 |
| 552 | 4 45 4 | 54 | 584 | 8 33 3 | 100 | 616 | 14 27 15 | 135 |
| 553 | 4 49 37 | 56 | 585 | 8 34 20 | 101 | 617 | 14 42 23 | 137 |
| 554 | 4 53 22 | 57 | 586 | 8 41 49 | 101 | 618 | 15 5 23 | 141 |
| 555 | 5 8 47 | 59 | 587 | 8 45 41 | 102 | 619 | 15 37 34 | 144 |
| 556 | 5 18 39 | 63 | 588 | 9 10 30 | 105 | 620 | 15 38 54 | 144 |
| 557 | 5 23 16 | 64 | 589 | 9 20 15 | 105 | 621 | 15 45 55 | 145 |
| 558 | 5 25 52 | 65 | 590 | 9 21 22 | 106 | 622 | 15 51 36 | 146 |
| 559 | 5 40 36 | 70 | 591 | 9 23 33 | 106 | 623 | 15 54 51 | 146 |
| 560 | 5 41 37 | 71 | 592 | 9 49 16 | 107 | 624 | 16 15 42 | 149 |
| 561 | 5 41 48 | 71 | 593 | 10 4 44 | 109 | 625 | 16 19 53 | 150 |
| 563 | 5 47 44 | 73 | 595 | 10 41 48 | 111 | 626 | 16 24 16 | 151 |
| 564 | 5 54 59 | 74 | 596 | 10 43 2 | 111 | 627 | 16 45 43 | 154 |
| 565 | 6 3 41 | 75 | 597 | 10 48 20 | 111 | 628 | 17 13 55 | 163 |
| 566 | 6 8 41 | 76 | 598 | 10 54 32 | 112 | 629 | 17 13 0 | 163 |
| 567 | 6 9 34 | 76 | 599 | 11 0 47 | 113 | 630 | 17 14 46 | 163 |
| 568 | 6 18 36 | 78 | 600 | 11 10 53 | 114 | 631 | 17 33 47 | 166 |
| 569 | 6 19 37 | 79 | 601 | 11 23 15 | 114 | 632 | 17 43 32 | 167 |
| 570 | 6 23 0 | 79 | 602 | 11 40 39 | 116 | 633 | 17 53 49 | 168 |
| 571 | 6 33 2 | 81 | 603 | 11 42 28 | 116 | 634 | 17 54 38 | 169 |
| 572 | 6 55 24 | 84 | 604 | 11 42 56 | 116 | 635 | 17 56 11 | 170 |
| 573 | 6 56 11 | 84 | 605 | 12 13 58 | 119 | 636 | 18 2 4 | 172 |
| 574 | 7 1 18 | 85 | 606 | 12 19 48 | 119 | 637 | 18 3 54 | 172 |
| 575 | 7 9 21 | 87 | 607 | 12 35 2 | 120 | 638 | 18 4 10 | 173 |
| 576 | 8 13 59 | 99 | 608 | 13 4 33 | 124 | 639 | 18 11 40 | 176 |
| 577 | 7 14 21 | 87 | 609 | 13 4 30 | 124 | 640 | 18 16 3 | 177 |
| 578 | 7 21 47 | 89 | 610 | 13 17 28 | 125 | 641 | 18 19 42 | 177 |
| 579 | 7 26 40 | 90 | 611 | 13 31 15 | 127 | 642 | 18 26 15 | 180 |
| 580 | 7 37 58 | 91 | 612 | 13 33 10 | 127 | 643 | 18 29 41 | 180 |
| 581 | 7 57 13 | 95 | 613 | 13 16 3 | 129 | 645 | 18 38 1 | 181 |

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| 645 | 22° 42' 57" | 184 | 678 | 22° 51' 20" | 219 | 709 | 22° 55' 20" | 249 |
| 647 | 22 39 30 | 184 | 679 | 21 1 23 | 223 | 710 | 22 36 57 | 250 |
| 648 | 22 36 30 | 184 | 680 | 21 1 52 | 223 | 711 | 22 39 29 | 251 |
| 649 | 22 34 24 | 185 | 681 | 21 7 40 | 225 | 712 | 22 49 58 | 253 |
| 650 | 22 26 20 | 185 | 682 | 21 8 30 | 225 | 713 | 22 50 55 | 253 |
| 651 | 22 23 13 | 185 | 683 | 21 20 43 | 229 | 714 | 23 7 56 | 257 |
| 652 | 22 22 36 | 185 | 684 | 21 23 53 | 230 | 715 | 23 8 25 | 257 |
| 653 | 22 20 29 | 193 | 685 | 21 24 31 | 230 | 716 | 23 9 15 | 257 |
| 654 | 22 20 24 | 193 | 686 | 21 33 43 | 232 | 717 | 23 12 11 | 259 |
| 655 | 22 20 34 | 194 | 687 | 21 34 53 | 233 | 718 | 23 16 3 | 260 |
| 656 | 22 15 34 | 195 | 688 | 21 37 43 | 234 | 719 | 23 18 22 | 260 |
| 657 | 22 35 40 | 197 | 689 | 21 38 43 | 234 | 720 | 23 28 0 | 262 |
| 658 | 22 30 1 | 197 | 690 | 21 39 50 | 237 | 721 | 23 30 7 | 263 |
| 659 | 22 48 48 | 199 | 691 | 21 40 4 | 237 | 722 | 23 32 33 | 263 |
| 660 | 22 31 29 | 204 | 692 | 21 44 49 | 237 | 723 | 23 34 32 | 263 |
| 661 | 22 18 33 | 205 | 693 | 21 49 54 | 238 | 724 | 23 34 46 | 264 |
| 662 | 22 14 0 | 206 | 694 | 21 58 6 | 240 | 725 | 23 36 36 | 264 |
| 663 | 22 17 39 | 207 | 695 | 21 58 33 | 240 | 726 | 23 40 21 | 265 |
| 664 | 22 11 20 | 207 | 696 | 21 58 13 | 240 | 727 | 23 41 26 | 265 |
| 665 | 22 13 53 | 207 | 697 | 22 3 27 | 240 | 728 | 23 46 7 | 266 |
| 666 | 22 13 4 | 207 | 698 | 22 5 55 | 241 | 729 | 23 49 11 | 267 |
| 668 | 22 09 29 | 210 | 699 | 22 7 45 | 242 | 730 | 23 52 32 | 267 |
| 669 | 22 08 24 | 210 | 700 | 22 21 35 | 244 | 731 | 23 53 27 | 268 |
| 670 | 22 18 33 | 213 | 701 | 22 22 10 | 245 | 732 | 23 51 18 | 268 |
| 671 | 22 09 53 | 215 | 702 | 22 24 43 | 246 | 733 | 23 55 54 | 268 |
| 672 | 22 20 1 | 215 | 703 | 22 26 21 | 247 | CATALOGUE XI | | |
| 673 | 22 20 34 | 215 | 704 | 22 27 3 | 247 | 734 | 0 46 47 | 13 |
| 674 | 22 20 13 | 215 | 705 | 22 28 18 | 248 | 735 | 0 58 53 | 15 |
| 675 | 22 28 31 | 215 | 706 | 22 29 40 | 248 | 736 | 1 39 38 | 24 |
| 676 | 22 31 27 | 215 | 707 | 22 29 35 | 248 | 738 | 2 18 9 | 39 |
| 677 | 22 33 13 | 215 | 708 | 22 33 34 | 248 | 739 | 2 19 33 | 31 |

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| 741 | 2 51 58 | 35 | 772 | 22 49 18 | 253 | 802 | 13 43 40 | 129 |
| 742 | 3 17 0 | 38 | 773 | 23 0 12 | 255 | 803 | 14 4 46 | 131 |
| 743 | 3 46 36 | 43 | 774 | 23 25 19 | 262 | 804 | 14 31 42 | 135 |
| 744 | 4 16 32 | 47 | 775 | 23 30 45 | 263 | 805 | 14 32 58 | 136 |
| 745 | 4 19 11 | 48 | CATALOGUE XII | | | 806 | 14 33 27 | 136 |
| 746 | 4 27 13 | 49 | 776 | 0 10 53 | 8 | 807 | 14 36 37 | 137 |
| 747 | 4 28 50 | 49 | 777 | 0 14 56 | 4 | 808 | 14 51 53 | 139 |
| 748 | 4 46 4 | 55 | 778 | 0 19 43 | 4 | 809 | 15 3 3 | 140 |
| 749 | 4 57 37 | 58 | 779 | 0 21 37 | 5 | 810 | 15 46 55 | 141 |
| 750 | 5 0 5 | 58 | 780 | 0 26 0 | 7 | 811 | 16 0 4 | 142 |
| 751 | 5 1 16 | 58 | 781 | 0 44 2 | 12 | 812 | 16 1 42 | 148 |
| 752 | 5 37 19 | 70 | 782 | 1 13 20 | 19 | 813 | 16 23 2 | 151 |
| 753 | 6 23 43 | 80 | 783 | 1 32 39 | 23 | 814 | 16 23 9 | 151 |
| 754 | 6 30 22 | 81 | 784 | 1 39 34 | 24 | 815 | 16 23 16 | 151 |
| 755 | 6 31 14 | 81 | 785 | 1 54 4 | 28 | 816 | 16 27 0 | 152 |
| 756 | 6 41 0 | 82 | 786 | 2 9 18 | 29 | 817 | 16 27 29 | 152 |
| 757 | 7 8 10 | 86 | 787 | 3 25 49 | 39 | 818 | 16 28 49 | 152 |
| 758 | 7 19 55 | 88 | 788 | 3 27 9 | 39 | 819 | 16 30 26 | 152 |
| 759 | 18 3 49 | 172 | 789 | 4 23 30 | 49 | 820 | 16 33 8 | 153 |
| 760 | 18 9 30 | 175 | 790 | 10 4 5 | 108 | 821 | 16 47 13 | 153 |
| 761 | 19 31 45 | 194 | 791 | 11 13 26 | 114 | 822 | 16 58 40 | 153 |
| 762 | 20 9 19 | 204 | 792 | 11 35 32 | 115 | 823 | 17 0 20 | 153 |
| 763 | 20 15 43 | 206 | 793 | 11 37 26 | 115 | 824 | 17 12 41 | 167 |
| 764 | 20 52 22 | 219 | 794 | 11 47 2 | 116 | 825 | 17 58 20 | 171 |
| 765 | 20 53 9 | 219 | 795 | 11 53 51 | 117 | 826 | 18 2 5 | 172 |
| 766 | 21 16 45 | 228 | 796 | 12 11 16 | 118 | 827 | 19 38 7 | 173 |
| 767 | 21 19 19 | 229 | 797 | 12 28 27 | 120 | 828 | 19 41 3 | 198 |
| 768 | 21 19 9 | 238 | 798 | 12 58 13 | 123 | 829 | 19 43 2 | 198 |
| 769 | 22 1 37 | 241 | 799 | 13 1 7 | 124 | 830 | 19 49 8 | 199 |
| 770 | 22 27 47 | 247 | 800 | 13 13 52 | 125 | 831 | 19 51 59 | 199 |

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| 833 | 22 38 14 | 203 | CATALOGUE XIII | | | 803 | 5 56 49 | 74 |
| 834 | 22 38 18 | 203 | 864 | 0 6 40 | 2 | 804 | 6 9 27 | 76 |
| 835 | 22 38 30 | 203 | 865 | 0 38 52 | 10 | 805 | 6 12 23 | 77 |
| 836 | 21 2 27 | 221 | 866 | 0 30 43 | 11 | 806 | 6 23 48 | 80 |
| 837 | 21 2 33 | 224 | 867 | 0 53 56 | 15 | 807 | 6 44 42 | 82 |
| 838 | 21 14 34 | 227 | 868 | 1 2 51 | 16 | 808 | 6 45 0 | 83 |
| 839 | 21 16 24 | 227 | 869 | 1 30 3 | 22 | 809 | 6 52 9 | 83 |
| 840 | 21 46 33 | 237 | 870 | 1 36 23 | 24 | 900 | 6 58 33 | 85 |
| 841 | 21 46 24 | 238 | 871 | 1 41 49 | 25 | 901 | 7 11 1 | 87 |
| 842 | 21 3 30 | 241 | 872 | 1 54 28 | 28 | 902 | 7 52 22 | 94 |
| 843 | 21 12 32 | 244 | 873 | 1 56 7 | 28 | 903 | 7 58 9 | 96 |
| 844 | 21 43 33 | 246 | 874 | 2 3 8 | 28 | 904 | 8 7 52 | 98 |
| 845 | 21 35 33 | 248 | 875 | 2 11 6 | 29 | 905 | 8 10 59 | 98 |
| 846 | 21 32 34 | 251 | 876 | 2 16 46 | 30 | 906 | 8 11 23 | 98 |
| 847 | 21 43 34 | 252 | 877 | 2 44 32 | 33 | 907 | 8 11 4 | 99 |
| 848 | 21 41 38 | 253 | 878 | 3 21 28 | 39 | 908 | 9 8 25 | 104 |
| 849 | 21 47 33 | 254 | 879 | 3 22 3 | 39 | 909 | 9 25 25 | 106 |
| 850 | 21 34 36 | 254 | 880 | 3 37 3 | 41 | 910 | 9 27 10 | 107 |
| 851 | 21 32 38 | 255 | 881 | 4 29 4 | 51 | 911 | 10 2 41 | 108 |
| 852 | 21 3 33 | 256 | 882 | 4 32 12 | 52 | 912 | 10 16 26 | 109 |
| 853 | 21 11 35 | 258 | 883 | 4 44 33 | 53 | 913 | 10 36 26 | 110 |
| 854 | 21 11 38 | 260 | 884 | 4 57 22 | 58 | 914 | 10 39 46 | 111 |
| 855 | 23 32 23 | 263 | 885 | 5 4 53 | 59 | 915 | 10 43 13 | 111 |
| 856 | 23 11 1 | 263 | 885 ¹ | 5 11 3 | 60 | 916 | 11 8 4 | 113 |
| 857 | 22 43 28 | 264 | 886 | 5 14 24 | 61 | 917 | 11 37 25 | 115 |
| 858 | 23 43 33 | 264 | 887 | 5 14 33 | 61 | 918 | 11 50 36 | 117 |
| 859 | 23 46 35 | 266 | 888 | 5 18 40 | 62 | 919 | 11 53 7 | 117 |
| 860 | 23 41 38 | 266 | 889 | 5 20 13 | 62 | 920 | 12 9 31 | 118 |
| 861 | 23 37 33 | 267 | 890 | 5 26 44 | 63 | 921 | 12 11 42 | 119 |
| 862 | 23 41 35 | 267 | 891 | 5 46 33 | 63 | 922 | 12 19 58 | 119 |

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| 923 | 12 22 ^m 12 ^s | 120 | 954 | 16 50 ^m 6 ^s | 154 | 985 | 23 13 ^m 12 ^s | 206 |
| 924 | 12 35 32 | 121 | 955 | 16 55 50 | 155 | 986 | 20 14 10 | 206 |
| 925 | 12 51 6 | 121 | 956 | 17 4 10 | 159 | 987 | 20 24 50 | 210 |
| 926 | 12 52 14 | 121 | 957 | 17 8 38 | 159 | 988 | 21 2 28 | 224 |
| 927 | 12 56 34 | 122 | 958 | 17 9 25 | 159 | 989 | 21 39 13 | 234 |
| 928 | 12 57 10 | 122 | 959 | 17 16 9 | 163 | 990 | 22 1 32 | 240 |
| 929 | 12 57 43 | 123 | 960 | 17 32 3 | 166 | 991 | 22 9 1 | 242 |
| 930 | 13 0 28 | 123 | 961 | 17 33 32 | 166 | 992 | 23 13 48 | 258 |
| 931 | 13 4 51 | 124 | 962 | 17 33 45 | 166 | 993 | 23 36 42 | 265 |
| 932 | 13 28 18 | 126 | 963 | 17 33 32 | 166 | 994 | 23 37 31 | 265 |
| 933 | 13 29 7 | 127 | 964 | 17 47 39 | 168 | 995 | 23 41 35 | 265 |
| 934 | 13 32 50 | 127 | 965 | 18 20 2 | 178 | 996 | 23 46 34 | 266 |
| 935 | 13 39 33 | 128 | 966 | 18 25 25 | 179 | 997 | 23 58 47 | 271 |
| 936 | 13 51 3 | 130 | 967 | 18 34 5 | 181 | 998 | 0 7 30 | 2 |
| 937 | 13 51 52 | 130 | 968 | 18 40 38 | 181 | 999 | 1 20 29 | 20 |
| 938 | 13 59 29 | 131 | 969 | 18 43 49 | 182 | 1000 | 1 29 27 | 22 |
| 939 | 14 7 48 | 132 | 970 | 18 44 15 | 182 | 1001 | 1 43 5 | 25 |
| 940 | 14 21 9 | 134 | 971 | 18 44 24 | 183 | 1002 | 2 11 29 | 33 |
| 941 | 14 29 40 | 135 | 972 | 18 49 59 | 185 | 1003 | 3 40 25 | 42 |
| 942 | 14 47 29 | 138 | 973 | 18 55 58 | 186 | 1004 | 3 57 27 | 45 |
| 943 | 15 12 16 | 142 | 974 | 18 58 53 | 187 | 1005 | 3 59 20 | 45 |
| 944 | 15 25 34 | 143 | 975 | 19 10 4 | 189 | 1006 | 5 6 17 | 59 |
| 945 | 15 26 6 | 143 | 976 | 19 26 27 | 192 | 1007 | 5 34 22 | 69 |
| 946 | 15 44 44 | 145 | 977 | 19 31 19 | 193 | 1008 | 6 7 38 | 76 |
| 947 | 15 58 28 | 146 | 978 | 19 46 22 | 198 | 1009 | 7 3 30 | 83 |
| 948 | 15 59 20 | 147 | 979 | 19 47 57 | 198 | 1010 | 22 49 17 | 133 |
| 949 | 16 1 34 | 148 | 980 | 19 51 45 | 199 | 1011 | 22 55 53 | 134 |
| 950 | 16 18 41 | 150 | 981 | 19 52 49 | 200 | 1012 | 23 37 18 | 163 |
| 951 | 16 18 59 | 150 | 982 | 20 6 51 | 203 | 1013 | 23 42 10 | 166 |
| 952 | 16 31 9 | 152 | 983 | 20 19 11 | 204 | 1014 | 0 1 24 | 1 |
| 953 | 16 37 21 | 153 | 984 | 20 19 31 | 205 | 1015 | 0 14 27 | 4 |

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| 1016 | 5 10 30 | 75 | 1046 | 5 45 10 | 75 | 1078 | 11 35 47 | 115 |
| 1017 | 5 10 30 | 75 | 1047 | 5 45 13 | 75 | 1079 | 11 54 34 | 117 |
| 1018 | 5 10 31 | 75 | 1048 | 5 45 37 | 75 | 1080 | 12 22 35 | 120 |
| 1019 | 5 10 30 | 75 | 1049 | 5 47 3 | 75 | 1081 | 12 34 32 | 121 |
| 1020 | 5 11 10 | 75 | 1050 | 5 40 55 | 75 | 1082 | 12 55 35 | 122 |
| 1021 | 5 11 3 | 75 | 1051 | 5 37 1 | 75 | 1083 | 13 0 27 | 123 |
| 1022 | 5 11 11 | 75 | 1052 | 5 35 37 | 75 | 1084 | 13 15 50 | 125 |
| 1023 | 5 11 11 | 75 | 1053 | 5 35 18 | 75 | 1085 | 14 32 37 | 130 |
| 1024 | 5 11 11 | 75 | 1054 | 5 45 17 | 75 | 1086 | 15 1 27 | 140 |
| 1025 | 5 11 18 | 75 | 1055 | 5 31 53 | 75 | 1087 | 16 4 35 | 148 |
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| 1026 | 5 11 18 | 75 | 1058 | 5 5 13 | 75 | 1089 | 17 23 22 | 165 |
| 1027 | 5 11 14 | 75 | 1059 | 5 15 10 | 75 | 1090 | 17 27 43 | 165 |
| 1028 | 5 11 10 | 75 | 1060 | 5 32 38 | 81 | 1091 | 18 8 35 | 174 |
| 1029 | 5 11 10 | 75 | 1061 | 5 35 54 | 91 | 1092 | 22 33 3 | 249 |
| 1030 | 5 11 17 | 75 | 1062 | 7 44 23 | 92 | CATALOGUE XVI | | |
| 1031 | 5 10 3 | 85 | 1063 | 7 44 15 | 92 | 1093 | 0 11 44 | 4 |
| 1032 | 5 10 17 | 85 | 1064 | 8 3 39 | 97 | 1094 | 0 23 29 | 5 |
| 1033 | 5 10 10 | 105 | 1065 | 8 10 4 | 97 | 1095 | 0 23 17 | 5 |
| 1034 | 5 10 17 | 714 | 1066 | 8 18 11 | 99 | 1096 | 0 29 40 | 8 |
| 1035 | 5 10 10 | 108 | 1067 | 8 20 17 | 99 | 1097 | 0 30 30 | 8 |
| 1036 | 5 10 10 | 108 | 1068 | 8 31 2 | 105 | 1098 | 0 47 53 | 13 |
| 1037 | 5 10 10 | 108 | 1069 | 8 30 10 | 105 | 1099 | 0 49 51 | 14 |
| CATALOGUE XV | | | 1070 | 9 27 8 | 105 | 1100 | 1 7 9 | 18 |
| 1039 | 5 10 10 | 108 | 1071 | 9 34 20 | 105 | 1101 | 1 17 27 | 19 |
| 1040 | 5 10 10 | 108 | 1072 | 9 38 50 | 105 | 1102 | 1 19 39 | 20 |
| 1041 | 5 10 10 | 108 | 1073 | 9 38 55 | 115 | 1103 | 1 35 13 | 23 |
| 1042 | 5 10 30 | 108 | 1074 | 10 28 20 | 115 | 1104 | 1 36 2 | 23 |
| 1043 | 5 10 10 | 11 | 1075 | 10 30 15 | 115 | 1105 | 3 11 26 | 43 |
| 1044 | 5 10 10 | 11 | 1076 | 10 30 15 | 115 | 1106 | 3 42 58 | 43 |
| 1045 | 5 10 10 | 11 | 1077 | 10 30 15 | 115 | 1107 | 13 20 37 | 126 |

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| 1108 | 13 ^h 46 ^m 32 ^s | 130 | 1139 | 20 ^h 58 ^m 39 ^s | 222 | 1169 | 1 ^h 41 ^m 17 ^s | 26 |
| 1109 | 14 3 18 | 131 | 1140 | 21 14 1 | 227 | 1170 | 2 9 39 | 29 |
| 1110 | 14 12 29 | 132 | 1141 | 21 22 6 | 229 | 1171 | 2 12 46 | 29 |
| 1111 | 14 17 29 | 133 | 1142 | 21 25 7 | 230 | 1172 | 2 21 27 | 31 |
| 1112 | 14 26 3 | 135 | 1143 | 21 35 14 | 233 | 1173 | 2 51 38 | 35 |
| 1113 | 14 41 21 | 137 | 1144 | 22 37 23 | 250 | 1174 | 2 57 46 | 36 |
| 1114 | 15 21 42 | 142 | 1145 | 22 42 45 | 251 | 1175 | 2 57 49 | 36 |
| 1115 | 16 18 13 | 150 | 1146 | 22 42 49 | 251 | 1176 | 3 5 9 | 37 |
| 1116 | 16 36 51 | 153 | 1147 | 22 57 5 | 255 | 1177 | 3 12 45 | 38 |
| 1117 | 16 49 34 | 154 | 1148 | 23 22 2 | 261 | 1178 | 3 17 20 | 38 |
| 1118 | 17 3 30 | 158 | 1149 | 23 24 11 | 261 | 1179 | 3 20 47 | 39 |
| 1119 | 17 9 40 | 160 | 1150 | 23 24 46 | 261 | 1180 | 3 22 23 | 39 |
| 1120 | 17 21 14 | 165 | 1151 | 23 25 6 | 262 | 1181 | 3 32 54 | 40 |
| 1121 | 17 31 52 | 165 | 1152 | 23 42 18 | 266 | 1182 | 3 35 30 | 41 |
| 1122 | 17 44 38 | 167 | 1153 | 23 46 45 | 266 | 1183 | 3 37 36 | 42 |
| 1123 | 17 45 20 | 168 | 1154 | 23 53 12 | 267 | 1184 | 3 41 11 | 43 |
| 1124 | 17 54 38 | 169 | CATALOGUE XVII | | | 1185 | 4 18 52 | 48 |
| 1125 | 17 55 40 | 170 | 1155 | 0 0 26 | 1 | 1186 | 4 20 51 | 48 |
| 1126 | 17 56 53 | 170 | 1156 | 0 19 58 | 5 | 1187 | 4 45 14 | 55 |
| 1127 | 17 58 59 | 171 | 1157 | 0 22 30 | 5 | 1188 | 5 11 33 | 72 |
| 1128 | 18 23 12 | 179 | 1158 | 0 24 55 | 7 | 1189 | 5 31 18 | 73 |
| 1129 | 19 18 51 | 190 | 1159 | 0 32 28 | 9 | 1190 | 5 34 17 | 73 |
| 1130 | 19 29 19 | 193 | 1160 | 0 43 24 | 12 | 1191 | 6 10 8 | 79 |
| 1131 | 19 33 13 | 195 | 1161 | 0 55 53 | 15 | 1192 | 6 28 59 | 79 |
| 1132 | 19 38 11 | 196 | 1162 | 1 3 52 | 17 | 1193 | 6 44 21 | 82 |
| 1133 | 19 51 56 | 200 | 1163 | 1 18 18 | 20 | 1194 | 7 22 21 | 89 |
| 1134 | 20 19 29 | 208 | 1164 | 1 21 26 | 21 | 1195 | 7 45 35 | 90 |
| 1135 | 20 25 19 | 210 | 1165 | 1 25 1 | 21 | 1196 | 8 8 55 | 98 |
| 1136 | 20 28 6 | 211 | 1166 | 1 31 45 | 22 | 1197 | 13 51 1 | 131 |
| 1137 | 20 52 37 | 219 | 1167 | 1 33 19 | 23 | 1198 | 16 16 8 | 143 |
| 1138 | 20 58 34 | 221 | 1168 | 1 43 18 | 26 | 1199 | 16 37 23 | 143 |

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| 1200 | 17 55 33 | 199 | 1230 | 4 24 43 | 21 | 1261 | 21 15 40 | 228 |
| 1201 | 17 55 33 | 199 | 1231 | 4 24 43 | 40 | 1262 | 21 15 40 | 228 |
| 1202 | 17 55 33 | 199 | 1232 | 4 24 43 | 40 | 1263 | 21 38 40 | 234 |
| 1203 | 17 55 33 | 199 | 1233 | 4 24 43 | 40 | 1264 | 22 24 1 | 246 |
| 1204 | 17 55 33 | 199 | 1234 | 4 24 43 | 47 | 1265 | 22 35 18 | 249 |
| 1205 | 17 55 33 | 199 | 1235 | 4 24 43 | 48 | 1266 | 23 21 20 | 261 |
| 1206 | 17 55 33 | 199 | 1236 | 4 24 43 | 52 | CATALOGUE XIX | | |
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| 1208 | 17 55 33 | 211 | 1238 | 4 53 53 | 57 | 1268 | 7 9 11 | 86 |
| 1209 | 17 55 33 | 214 | 1239 | 5 23 28 | 63 | 1269 | 10 28 18 | 110 |
| 1210 | 20 56 6 | 220 | 1240 | 5 30 56 | 69 | 1270 | 13 57 46 | 131 |
| 1211 | 20 56 6 | 221 | 1241 | 6 2 27 | 71 | 1271 | 14 13 1 | 133 |
| 1212 | 20 56 6 | 222 | 1242 | 6 3 42 | 75 | 1272 | 14 13 22 | 133 |
| 1213 | 20 56 6 | 225 | 1243 | 8 7 19 | 97 | 1273 | 14 14 2 | 133 |
| 1214 | 20 56 6 | 225 | 1244 | 8 7 31 | 97 | 1274 | 18 12 35 | 177 |
| 1215 | 22 14 42 | 232 | 1245 | 12 11 21 | 110 | | | |
| 1216 | 22 14 42 | 232 | 1246 | 14 12 12 | 132 | 1275 | 2 6 21 | 29 |
| 1217 | 22 15 33 | 138 | 1247 | 17 7 3 | 159 | 1276 | 3 47 4 | 43 |
| 1218 | 22 15 33 | 142 | 1248 | 17 16 31 | 161 | 1277 | 3 58 15 | 45 |
| 1219 | 22 42 27 | 151 | 1249 | 17 19 36 | 161 | 1278 | 4 7 0 | 46 |
| 1220 | 23 22 23 | 257 | 1250 | 17 28 14 | 165 | 1279 | 7 4 26 | 85 |
| 1221 | 23 22 23 | 261 | 1251 | 17 28 35 | 167 | 1280 | 10 19 55 | 109 |
| 1222 | 23 22 23 | 261 | 1252 | 18 15 55 | 177 | 1281 | 10 21 18 | 110 |
| 1223 | 23 50 53 | 267 | 1253 | 18 27 13 | 180 | 1282 | 11 7 43 | 113 |
| 1224 | 23 50 53 | 267 | 1254 | 18 38 52 | 181 | 1283 | 11 8 7 | 114 |
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| 1225 | 1 11 18 | 19 | 1256 | 19 12 46 | 189 | 1285 | 18 59 31 | 187 |
| 1226 | 1 11 18 | 19 | 1257 | 19 30 27 | 191 | 1286 | 19 21 39 | 191 |
| 1227 | 1 11 18 | 19 | 1258 | 19 55 26 | 199 | 1287 | 19 34 5 | 195 |
| 1228 | 1 11 18 | 19 | 1259 | 20 16 33 | 197 | 1288 | 19 35 39 | 196 |
| 1229 | 1 11 18 | 19 | 1260 | 20 16 33 | 197 | 1289 | 19 56 38 | 201 |
| 1230 | 1 11 18 | 19 | | | | 1290 | 20 56 59 | 220 |

APPENDIX

APPENDIX

CORRECTIONS

- β 1096** (page 8). For B and C read AB and C.
 β 309 (page 49). For 3-inch read 6 inch.
 β 555 (page 59). In the measures of B and C for 1880.82 read 1880-82. The close pair was examined a number of times in those years.
 β 1281 (page 110). The identity of this pair with OS 218 was overlooked when it was placed in the catalogue. A comparison of the recent measures with those of Madler and OS show clearly direct motion in angle.
 β 120 (page 149). In the last measure of AB and C for 320.4 read 330.4.
 β 815 (page 151). The direction of the proper motion, given as $141^{\circ}6$, is that of the principal star. If the companion is moving, as seems most probable, the direction of its motion would be $321^{\circ}6$.
 β 1204 (page 188). Insert the word "than" in the third line, making it read, "four other stars nearer than the Struve companion."
 β 1092 (page 249). In the measure of AB of 1899.71 for $229^{\circ}5$ read $209^{\circ}5$.
 β 1025 (page 255). In the Right Ascension for 22^h read 23.

ADDITIONAL MEASURES

β 1026 (Page 2)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.89 | 313.4 | 0.20 | 1 ^m | Aitken |
|---------|-------|------|----------------|--------|

There appears to be a very decided change in the angle since my measures in 1888.

β 1156 (Page 5)

| | | | | |
|---------|------|------|----------------|--------|
| 1899.57 | 31.0 | 0.54 | 2 ^m | Aitken |
|---------|------|------|----------------|--------|

There seems to be no sensible change.

β 107 (Page 5)

| | | | | |
|----|---------|-------|--------|----------------|
| AB | 1899.82 | 354.8 | 5.78 | 2 ^m |
| AC | 1899.82 | 339.7 | 46.83 | 2 ^m |
| AD | 1899.82 | 146.6 | 3.30 | 2 ^m |
| AE | 1899.82 | 171.0 | 113.48 | 2 ^m |
| AF | 1899.82 | 113.8 | 150.32 | 2 ^m |

The interval is too short to show change in the distant stars. This will be cleared up by later measures. Change in AB is certain, but it may be due to the proper motion of one of the components.

β 1226 (Page 7)

| | | | | |
|---------|-------|------|----------------|---------|
| 1899.55 | 187.3 | 0.34 | 3 ^m | Aitken |
| 1899.85 | 191.3 | 0.53 | 2 ^m | Barnard |

Probably no material change since the measures of 1894.

β 1096 (Page 8)

| | | | | | |
|---------|-------|-------|----------------|---------|----------|
| 1899.57 | 266.7 | 0.19 | 3 ^m | Aitken | A and B |
| 1899.76 | 61.6 | 33.78 | 2 ^m | Barnard | AB and C |

β 1097 (Page 8)

| | | | | |
|---------|-------|------|----------------|---------|
| 1899.85 | 251.4 | 0.40 | 3 ^m | Barnard |
|---------|-------|------|----------------|---------|

β 305 (Page 9)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.72 | 286.7 | 0.48 | 3 ^m | Aitken |
|---------|-------|------|----------------|--------|

In two of the measures the components were rated as equal in magnitude.

β 1150 (Page 10)

Examined by AITKEN (1899.89) and elongation suspected in $52^{\circ} \pm$, with distance of 0.72 or less, but conditions not good enough for accurate measurement.

β 301 (Page 11)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.68 | 319.2 | 2.86 | 2 ^m | Aitken |
|---------|-------|------|----------------|--------|

No relative motion since 1894.

β 1000 (Page 11)

| | | | | |
|---------|-------|-------|----------------|--------|
| 1899.89 | 112.0 | 10.24 | 2 ^m | Aitken |
|---------|-------|-------|----------------|--------|

This most recent includes the single measure previously given of 1896.49.

β 1162 (Page 37)

| | | | | |
|---------|-------|------|----|---------|
| 1899.54 | 189.1 | 10.0 | 30 | Aitken |
| 1899.54 | 189.1 | 10.0 | 30 | Barnard |

No change in the angle has been observed since 1899.

 β 1163 (Page 37)

| | | | | |
|---------|-------|-------|----|---------|
| 1899.54 | 184.1 | 10.10 | 30 | Aitken |
| 1899.54 | 184.1 | 0.25 | 30 | Barnard |

The angle between the stars has only increased in 1899. In nine years the angle has increased more than 10°.

 β 514 (Page 38) (Barnard's Double)

| | | | | |
|---------|-------|------|----|--------|
| 1899.54 | 176.1 | 10.0 | 30 | Aitken |
|---------|-------|------|----|--------|

 β 1170 (Page 38)

| | | | | |
|---------|-------|------|----|--------|
| 1899.54 | 180.8 | 10.0 | 15 | Aitken |
|---------|-------|------|----|--------|

In 1890 I made the angle 313.3, but it is a very difficult pair, and the apparent change requires confirming.

 β 1172 (Page 41)

| | | | | |
|---------|-------|------|----|---------|
| 1899.54 | 180.1 | 10.0 | 30 | Aitken |
| 1899.54 | 180.1 | 0.30 | 25 | Barnard |

 β 524 (Page 42) (Barnard's Companion)

| | | | | |
|---------|----|------|----|--------|
| 1899.54 | 25 | 10.0 | 30 | Aitken |
|---------|----|------|----|--------|

 β 1173 (Page 41)

| | | | | | |
|---------|-------|------|----|--------|----------|
| 1899.54 | 180.1 | 10.0 | 30 | Aitken | A and B |
| 1899.54 | 180.1 | 10.0 | 30 | Aitken | AB and C |

No change in the close pair is probable.

 β 1176 (Page 41) (Barnard's Triple)

| | | | | | |
|---------|-------|------|----|---------|----|
| 1899.54 | 180.1 | 10.0 | 30 | Aitken | AB |
| 1899.54 | 180.1 | 10.0 | 25 | Barnard | |
| 1899.54 | 180.1 | 10.0 | 25 | Willard | AC |
| 1899.54 | 180.1 | 10.0 | 25 | Barnard | |

A and B appear to have the same proper motion, and probably form a physical system. The change in C corresponds to the proper motion of A, and the distant companion is therefore not a member of the system.

 β 1178 (Page 38)

| | | | | |
|---------|-------|------|----|---------|
| 1899.54 | 348.4 | 0.54 | 10 | Barnard |
|---------|-------|------|----|---------|

No evidence of change since 1890.

B 1177 (Page 38)

| | | | | |
|---------|------|------|----|--------|
| 1899.58 | 12.0 | 0.35 | 30 | Aitken |
|---------|------|------|----|--------|

A difficult pair, but some change is probable.

 β 536 (Page 42)

| | | | | | |
|---------|-------|-------|----|---------|----|
| 1899.70 | 320.6 | 0.15 | 30 | Aitken | AB |
| 1899.65 | 8.0 | 18.38 | 20 | Barnard | CD |
| 1899.65 | 320.8 | 7.76 | 30 | Barnard | CE |

The 16 m star, E, has not been observed before. It is important that the close pair should be watched and measured in the near future.

 β 538 (Page 42)

| | | | | |
|---------|-------|------|----|--------|
| 1899.69 | 130.2 | 1.78 | 10 | Aitken |
|---------|-------|------|----|--------|

 β 1105 (Page 43)

| | | | | |
|---------|------|------|----|--------|
| 1899.70 | 19.4 | 0.32 | 20 | Aitken |
|---------|------|------|----|--------|

 β 1106 (Page 43)

| | | | | |
|---------|------|------|----|--------|
| 1899.69 | 19.6 | 0.35 | 10 | Aitken |
|---------|------|------|----|--------|

This measure is noted as "uncertain," and the apparent change of more than 30° in the past ten years may not be real. It is very difficult object with the largest aperture.

 β 1185 (Page 43)

| | | | | |
|---------|-------|------|----|--------|
| 1899.69 | 350.7 | 0.14 | 20 | Aitken |
|---------|-------|------|----|--------|

Very decided change in the angle.

β 550. α Tauri (Page 49)

| | | | | | |
|---------|-------|------|------------|---------|----|
| 1899.64 | 275.1 | 1.95 | 2 <i>n</i> | Barnard | CD |
|---------|-------|------|------------|---------|----|

 β 883 (Page 53)

| | | | | | |
|---------|------|------|------------|---------|--|
| 1899.75 | 54.4 | 0.25 | 7 <i>n</i> | Aitken | |
| 1899.75 | 58.7 | 0.38 | 1 <i>n</i> | See | |
| 1899.78 | 54.0 | 0.22 | 4 <i>n</i> | Barnard | |

A recent examination of all the measures of this star leads to the conclusion that the most probable period is about seventeen years. It is certain that the measures of 1891.97 to 1899.78 are properly adjusted as to quadrants, and that the angular motion in 7.8 years is only 110° . These measures are fairly consistent. A different and somewhat smaller value for the period may be found by rejecting the original position of 1879. This is a single observation, but it is substantially correct, unless an error was made in reading the position-circle, and this is very improbable.

 β 552 (Page 54)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.75 | 202.3 | 0.60 | 1 <i>n</i> | See | |
| 1899.79 | 202.8 | 0.45 | 4 <i>n</i> | Aitken | |

 β 1238 (Page 57)

| | | | | | |
|---------|------|------|------------|--------|--|
| 1899.92 | 15.8 | 1.48 | 1 <i>n</i> | Aitken | |
|---------|------|------|------------|--------|--|

Probably unchanged.

 β 555. β Orionis (Page 59)

| | | | | | |
|---------|-------|-----------|------------|---------|--|
| 1899.71 | 192 | 0.2 | 1 <i>n</i> | Aitken | |
| 1899.72 | 184 | 0.13 | 1 <i>n</i> | " | |
| 1899.82 | 172.7 | 0.1 \pm | 1 <i>n</i> | Barnard | |
| 1899.92 | 210.6 | 0.16 | 1 <i>n</i> | Aitken | |

This pair may have a period less than that of any known binary. It is difficult to adjust all the observations, positive and negative. The measures can be represented by a period of about five years, but upon any assumption the elongation should have been seen at some of the times when it was noted as single by apertures large enough to show it. If it is carefully watched with the largest telescopes, as it doubtless will be, the approximate period will be determined within a few years.

 β 557 (Page 64)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.73 | 146.0 | 0.29 | 1 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

 β 1239 (Page 65)

| | | | | | |
|---------|-------|-------|------------|--------|----|
| 1899.92 | 320.1 | 2.36 | 2 <i>n</i> | Aitken | BD |
| 1899.92 | 232.1 | 7.75 | 1 <i>n</i> | Aitken | AB |
| 1899.92 | 310.8 | 10.41 | 1 <i>n</i> | Aitken | AC |

 β 1240. 26 Aurigae (Page 66)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.92 | 330.8 | 0.20 | 2 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

 β 1032. σ Orionis (Page 68)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.79 | 329.0 | 0.20 | 3 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

The retrograde motion continues, with little or no change in the distance.

 β 1007. 126 Tauri (Page 69)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.54 | 243.5 | 0.21 | 3 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

This mean includes the single measure of 1899.17 given on page 69.

 β 1055 (Page 73)

| | | | | | |
|---------|-------|-------|------------|---------|----|
| 1899.80 | 333.6 | 2.15 | 4 <i>n</i> | Barnard | AB |
| 1899.77 | 327.8 | 33.38 | 3 <i>n</i> | Barnard | AC |

If the proper motion given from KUSTNER is substantially correct, the components of the close pair are moving together, as otherwise, the position angle of B at the date of the above measures would be $20^\circ 5'$ more than it was in 1888.

 β 1241. 4 Gemmae (Page 74)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.92 | 334.0 | 0.50 | 2 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

Change is probable in the close pair.

 β 1058. 1 Gemmae (Page 75)

| | | | | | |
|---------|-------|------|------------|--------|--|
| 1899.92 | 275.8 | 0.28 | 2 <i>n</i> | Aitken | |
|---------|-------|------|------------|--------|--|

Slow motion in angle is probable.

β 1102 (Page 160) (Polaris) (Polaris)
 1899.45 152.2 07.8 30 Aitken

β 1071 (Page 160) (Polaris)
 1899.45 152.2 07.8 30 Aitken

These stars resemble the sun at distances of 3.8 and 4.0 light years respectively. The distance is more about 100 light years, and the apparent angular displacement is 100 times.

β 1064 (Page 160) (Polaris)
 1899.45 152.2 07.8 30 Aitken

β 208 (Page 160)
 1899.45 152.2 07.8 30 Aitken

Characteristics point to the rapid motion.

β 1069 (Page 160)
 1899.45 152.2 07.8 30 Aitken

β 608 (Page 160)
 1899.45 152.2 07.8 30 Aitken

β 800 (Page 160)
 1899.45 152.2 07.8 30 Aitken

β 237 (Page 160)
 1899.45 152.2 07.8 30 Aitken

β 145 (Page 160)
 1899.45 152.2 07.8 30 Aitken

β 954 (Page 160)
 1899.45 152.2 07.8 30 Aitken

The stars resemble the sun at distances of 3.8 and 4.0 light years respectively.

β 1089 (Page 160)

1899.45 152.2 07.8 30 Aitken

These measures confirm the retrograde motion in angle.

β 062 (Page 160) (Polaris)

1899.71 144.3 05.9 10 Aitken

The angular motion is now rapid, and it has become a very difficult pair to measure.

β 131 (Page 170)

1899.62 278.5 2.85 40 Hussey

β 1128 (Page 170)

1897.73 197.9 3.70 20 See

SEE (A. J. 431) notes the principal star as a close equal pair, 205.5, 67.18 (1897.74).

β 971 (Page 183)

1899.71 16.8 0.30 10 Aitken

This will be an interesting system, but further measures are necessary to show the apparent orbit.

β 651 (Page 192)

1899.71 157.0 0.69 10 Doolittle

β 145 (Page 196)

| | | | | | |
|---------|-------|------|----|-----------|----|
| 1899.71 | 266.5 | 0.83 | 30 | Doolittle | AB |
| 1899.71 | 28.8 | 0.83 | 30 | " | AC |
| 1899.71 | 156.2 | 0.78 | 30 | " | AB |

β 827 (Page 196)

1899.66 266.1 0.74 10 Hussey

slow retrograde motion is probable

β 361 (Page 198)

| | | | | |
|---------|-------|------|----------------|-----------|
| 1899.71 | 358.9 | 3.86 | 3 ⁿ | Doolittle |
|---------|-------|------|----------------|-----------|

 β 979 (Page 198)

| | | | | |
|---------|-------|------|----------------|-----------|
| 1899.70 | 335.9 | 2.05 | 4 ⁿ | Doolittle |
|---------|-------|------|----------------|-----------|

 β 980. η Cygni (Page 199)

| | | | | | |
|---------|-------|-------|----------------|-----------|----|
| 1899.71 | 208.2 | 7.50 | 3 ⁿ | Doolittle | AB |
| 1899.71 | 326.8 | 46.29 | 3 ⁿ | " | AC |
| 1899.71 | 169.2 | 50.08 | 3 ⁿ | " | AD |

 β 429 (Page 202)

| | | | | | |
|---------|-------|-------|----------------|-----------|----|
| 1899.73 | 60.2 | 6.56 | 4 ⁿ | Doolittle | AB |
| 1899.73 | 25.3 | 8.89 | 4 ⁿ | " | AC |
| 1899.73 | 300.7 | 11.34 | 4 ⁿ | " | AD |
| 1899.73 | 107.1 | 28.28 | 4 ⁿ | " | AE |
| 1899.73 | 28.1 | 36.36 | 4 ⁿ | " | AF |
| 1899.73 | 109.1 | 9.68 | 4 ⁿ | " | FG |
| 1899.73 | 56.6 | 30.08 | 4 ⁿ | " | AH |

The faint star, H, has not been measured before.

 β 1260 (Page 207)

| | | | | |
|---------|-------|------|------------------|--------|
| 1899.71 | 164.1 | 0.48 | 3 2 ⁿ | Aitken |
|---------|-------|------|------------------|--------|

A difficult object, but without material change.

 β 1136 (Page 211)

| | | | | |
|---------|-------|------|----------------|---------|
| 1899.76 | 215.5 | 0.19 | 1 ⁿ | Barnard |
| 1899.82 | 200.9 | 0.39 | 1 ⁿ | Aitken |

In the last measure the distance is noted as uncertain.

 β 68 (Page 220)

| | | | | |
|---------|-------|------|----------------|---------|
| 1899.76 | 150.3 | 1.09 | 3 ⁿ | Barnard |
|---------|-------|------|----------------|---------|

 β 151. β Delphi (Page 211)

| | | | | |
|---------|-----|------|----------------|--------|
| 1899.76 | 7.9 | 0.68 | 2 ⁿ | See |
| 1899.76 | 5.5 | 0.58 | 3 ⁿ | Brown |
| 1899.68 | 3.8 | 0.60 | 2 ⁿ | Aitken |

 β 271 (Page 220)

| | | | | | |
|---------|-------|-------|----------------|---------|----|
| 1899.75 | 237.4 | 3.21 | 2 ⁿ | Barnard | AB |
| 1899.75 | 72.9 | 75.45 | 4 ⁿ | Barnard | AC |

The change in the distance of C corresponds to the proper motion of A.

 β 686 (Page 232)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.71 | 300.9 | 0.80 | 1 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

 β 1263 (Page 231)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.71 | 243.4 | 0.49 | 1 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

The measures indicate rapid motion in angle.

 β 989. κ Pegasi (Page 231)

| | | | | |
|---------|-------|------|----------------|-------|
| 1899.81 | 281.4 | 0.20 | 2 ⁿ | See |
| 1899.81 | 282.2 | 0.24 | 2 ⁿ | Brown |

 β 689 (Page 231)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.74 | 239.0 | 1.91 | 2 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

The components appear to be fixed.

 β 691 (Page 231)

| | | | | |
|---------|-------|------|----------------|----------|
| 1899.76 | 316.1 | 1.76 | 1 ⁿ | Barnard? |
|---------|-------|------|----------------|----------|

Change in angle is probable.

 β 1213 (Page 238)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.78 | 306.1 | 0.84 | 2 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

There may be some change in the angle.

 β 1265 (Page 241)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.74 | 241.1 | 0.34 | 1 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

 β 848 (Page 241)

| | | | | |
|---------|-------|------|----------------|--------|
| 1899.74 | 241.1 | 0.34 | 1 ⁿ | Aitken |
|---------|-------|------|----------------|--------|

β 78 (Page 251)

| | | | | | |
|---------|-------|-------|----|--------|----|
| 1899.81 | 156.7 | 294.6 | 29 | Double | AB |
| 1899.81 | 156.7 | 294.6 | 29 | Double | AC |

 β 180 (Page 254)

| | | | | | |
|---------|-------|-------|----|--------|--|
| 1899.81 | 174.5 | 338.2 | 29 | Double | |
| 1899.81 | 174.5 | 338.2 | 29 | Double | |

No material change.

 β 853 (Page 255)

| | | | | | |
|---------|-------|-------|----|--------|----|
| 1899.81 | 229.4 | 70.75 | 16 | Atiken | AB |
| 1899.81 | 229.4 | 70.75 | 16 | Atiken | AC |

No material change.

 β 718. 54 *Piganiol* (Page 260)

| | | | | | |
|---------|-------|------|----|--------|--|
| 1899.81 | 200.0 | 14.0 | 19 | Atiken | |
|---------|-------|------|----|--------|--|

Noted as "difficult and uncertain." The relative motion is obviously slow.

 β 720. 72 *Piganiol* (Page 262)

| | | | | | |
|---------|-------|------|----|-----|--|
| 1899.81 | 167.8 | 0.35 | 19 | See | |
|---------|-------|------|----|-----|--|

 β 721 (Page 263)

| | | | | | |
|---------|-------|------|----|-----|--|
| 1899.81 | 127.0 | 0.30 | 19 | See | |
|---------|-------|------|----|-----|--|

 β 733. 85 *Piganiol* (Page 266)

| | | | | | |
|---------|-------|------|----|--------|--|
| 1899.81 | 160.0 | —0.8 | 20 | Brown | |
| 1899.81 | 213.0 | —0.2 | 19 | See | |
| 1899.81 | 213.0 | —0.2 | 19 | Atiken | |

NEW NEBULAE

In looking over my old observing books used at the Lick Observatory, I find a good many nebulae noted from time to time which were not found in *DRYER'S General Catalogue*. These were accidentally picked up in the course of the double star work, and seen because they were in the field with some bright star. A few of these were measured from the star, and the places given in *Publications of the Lick Observatory*, Vol. II, pp. 155, 181. Many others were never reexamined at that time. Three of these I have looked up with the 40-inch, and measured their places from the adjacent stars. In each case the position given below is that of the star (1880).

Lalande 26702 and nebula

R.A. $14^{\text{h}} 33^{\text{m}} 29^{\text{s}}$ ϵ
Decl. $-15^{\circ} 41' 5''$

1899.285 236.7 284.46 Single distance

This star is the preceding of two, about 7 m.

D.M. (34) 2815 and nebula

R.A. $10^{\text{h}} 50^{\text{m}} 57^{\text{s}}$ ϵ
Decl. $+33^{\circ} 42' 5''$

1899.285 314.0 153.88 Single distance

The comparison star is $13^{\circ}.6$ preceding and $5^{\circ}.2$ south of 59 *Herculis*.

Piazzi XVIII. 203 and nebula

R.A. $18^{\text{h}} 43^{\text{m}} 30^{\text{s}}$ ϵ
Decl. $+19^{\circ} 11' 43''$

1899.249 86.8 112.99 Single distance

The comparison star is 6 m. Lalande 35032.



